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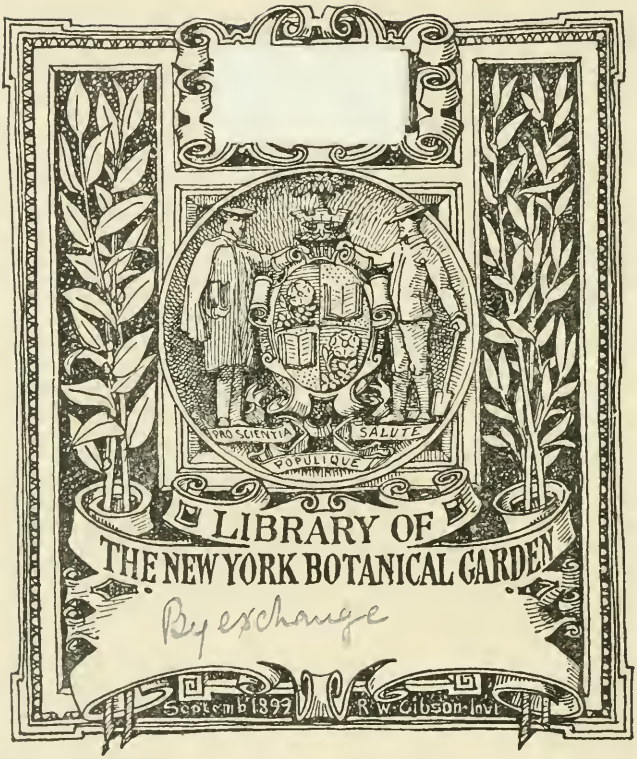
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TRINIDAD.

ROYAL BOTANIC GARDENS.

BULLETIN

OF

Miscellaneous Information.

No. 1. JANUARY, 1895. Vol. II.

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PRICE: TWOPENCE.

Edited by the Superintendent Royal Botanic Gardens,
J. H. HART, F.L.S.

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1895.

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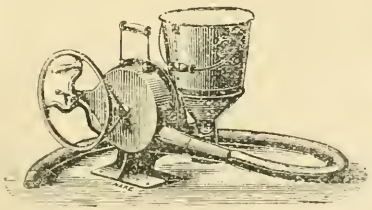
VOLUME II.

WHEN first issued the "Bulletin of Miscellaneous Information" consisted simply of "fly sheets" which were published at irregular intervals. A gradual improvement was effected during the past year, the numbers were continuously paged, the arrangement somewhat altered, and the Bulletin itself brought into a more handy and complete form, which it is proposed to continue with with very slight additions.

The Bulletin has been well received by the agricultural community, and the demand for it has been large. Copies are allotted, free of charge, to residents in the Island who choose to register their name and address at the office of the Royal Botanic Gardens, and persons outside the Colony can obtain it at the rate of twopence per copy. Postage extra.

The columns of the Bulletin are open to correspondents who are willing to contribute matter of interest to Botanists, Agriculturists, and Horticulturists in general, either in the form of articles or letters, as the Bulletin is specially maintained to further the development of these interests, to form a means of inter-communication and exchange of ideas with Colonies similarly situated, and to secure a complete record of facts and experiments which it is hoped will be useful for future reference.

WATTS' ASPHYXIATOR.



90.—THE PARASOL ANT.—*(An Exterminator.)*

ONE who has not seen the work of devastation which the little creature known as *Œcodoma cephalotes* or Parasol Ant, is capable of doing to the vegetative organs of trees and shrubs, can hardly realize the difficulty such attacks present to the cultivator in countries

where they are plentiful. In Trinidad, constant care is necessary to keep down their numbers, and many means have been devised from time to time for their extermination.

Under the name of "The Asphyxiator," Messrs. Watts & Co. of Bristol have introduced a handy machine which can be used for the purpose of killing nests with deadly effect.

In the agricultural districts it is a well known fact that large nests can be exterminated, by ordinary means, only at an enormous cost; sometimes as much as twenty or thirty dollars having to be paid for a single nest. With the machine I now illustrate, the same work can be accomplished for a tenth of this sum, if the nest be fairly accessible. The machine can be worked by anyone possessing ordinary intelligence. It can be seen at the Royal Botanic Gardens where it can be fully examined, and all necessary particulars ascertained.

The machine will destroy alike, nests in the ground, in walls, or in hollow trees, or in fact in any position in which they may be found. It is the duty of the planter however, after a nest has been destroyed, to effectually stop up the old entrances, so as to prevent a fresh colony gaining access thereto, for it is a well known fact that ants about to form a new colony prefer to go to a house which has been already occupied, than to provide one by their own labour, and especially so, if remnants of the fungus on which they feed are left in the old nest. Some people destroy them by fumes which kill the insect, but do not affect the fungus in any way, hence there remains a plentiful supply of food for the next party of ants that come along intent on establishing a new domicile; and this readily explains the reason why a nest quickly becomes active again after a fumigation of such a character. In our method, fumes are used which destroy the fungus as well as the animals in the nest, and for this reason it is much more effective, as there is certainly not the same temptation for ants to occupy an empty house as there would be for them to occupy a house with a larder well provided.

Through the kindness of Messrs. Watts & Co. I am able to illustrate the form of the machine. It will be readily seen that it is quite handy and can be carried and worked by one man, even in the most difficult places.

Mr. Bulmer, Postmaster-General, writes as follow of the action of the machine :—

"The Parasol Ant Destroying Machine did its work in a most efficient manner. The largest nest was in the walls of an old well long since filled up with earth.

"The smoke from the machine in escaping from the ground showed that the nest extended in a circle about 10 feet diameter. After using the machine about 15 minutes a small snake came out and died immediately. It is about three weeks since the nest was destroyed and there is not an ant to be seen near that place now.

"The next largest nest was in the roots of a large tamarind tree and although for several days afterwards no ants were seen, I noticed a few yesterday and I think it will be necessary to give them a second smoking.

"The smaller nests were completely destroyed and I consider the machine an excellent and inexpensive mode of destroying these pests.

"Yours, truly,

"J. A. BULMER."

Since writing the above the Machine has been worked before a Committee of the Agricultural Society of Trinidad, and the results considered highly favourable.

91.—COFFEE MACHINERY.

Little can be done in growing Coffee extensively unless suitable machinery is available for the preparation of the produce. We are aware that in some Coffee-growing countries, there is great conservatism as regards the use of modern machinery, and old and antiquated pulpers are still to be seen in use. Where, however, the growing of Coffee has been started in new countries, modern machinery has been adopted in preference to the old and lumbering mills formerly erected, and it is found that by their use the produce can be sent on the market in a superior style and with a smaller expenditure of labour than by the older methods.

Having been once introduced, the modern machinery, to use an Americanism, "comes to stay," as it is found that on short acquaintance it can be much more easily and economically managed than wooden mills of a by-gone century. No one firm has introduced more improvements in Coffee machinery than the firm of Messrs. John Gordon & Co. of New Broad Street, London, as was mentioned in article No. 56 on Liberian Coffee, Bulletin No. 23, July, 1894.

Feeling certain that their machines only required to be better known to be more generally adopted, I wrote to the Messrs. Gordon for figures, and they have kindly placed the illustrations given in this number at my disposal. No. 1 represents a machine suitable for pulping Liberian or Arabian Coffee. No. 2, a machine especially designed for larger estates, having a rotary screen and elevator for carrying unpulped berries a second time through the machine. No. 3 represents Smout's patent peeler and polisher, and No. 4 shows the fan used for cleaning the dried produce.

Besides these machines Messrs. Gordon manufacture one specially designed for cleaning Coffee dried in the cherry, and a pulper intended for small proprietors, who grow Arabian Coffee only, which will pulp 12 to 15 bushels per hour, costing only £14 f.o.b. in London.

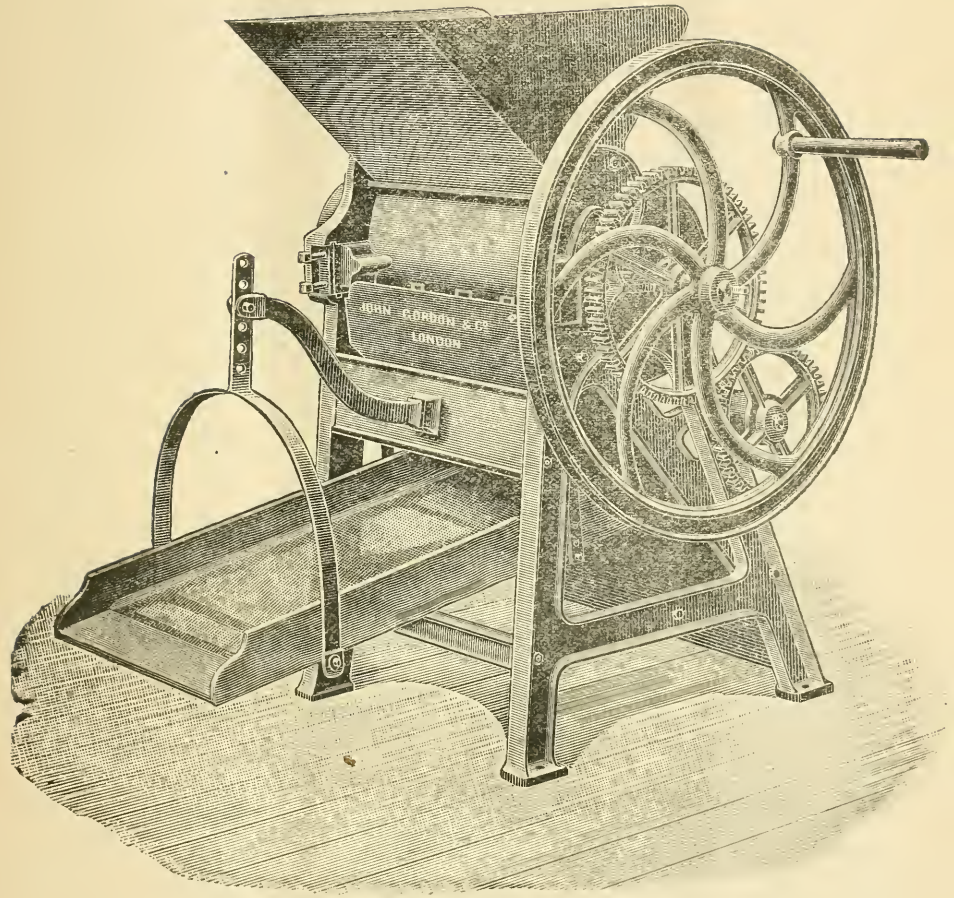
Messrs. Gordon also manufacture separators for Coffee and Cacao and other agricultural machinery in numerous classes. At the Royal Botanic Gardens we have one of Messrs. Gordon coffee pulpers which has been doing satisfactory work for the past six years. It can be seen at work during the season for harvesting Coffee, and special instruction in its use will be freely afforded to any planter making application. Smout's peeler is also in use, and can be seen at any time.

For producing Coffee for the English market, all that is required is a pulping machine, as once pulped Coffee can be dried in the parchment skin and shipped, to be cleaned in London, where it can be done much more economically than in the Colonies *(i.e.)* at a rate of some 2/6d. per cwt. When shipped dried in the cherry it will cost probably four times this amount to clean, in either London or Liverpool.

For home use and for Arabian Coffee, the machine known as the "Jamaica," the smallest made, would do satisfactory work, but it would be necessary to use a small size Smout's cleaner to take off the parchment skin after the pulping and drying has been completed.

Sufficient has been said to show the value of proper machinery for the preparation of Coffee, and it is clearly certain that no increase in our production of this staple can be expected until Gordon's or other satisfactory machinery has been introduced for the preparation of the produce.

It is not expected, however, that the introduction of such machinery can be otherwise than gradually effected, but when it is shown by its introduction in one or two places, how superior it is to the pestle and mortar methods still in use in our country districts; we may then expect a decided increase in the growth of a produce which our Trinidad lands are so well able to yield in abundance, and of a quality which will rank high in the world's markets. (See illustrations.)



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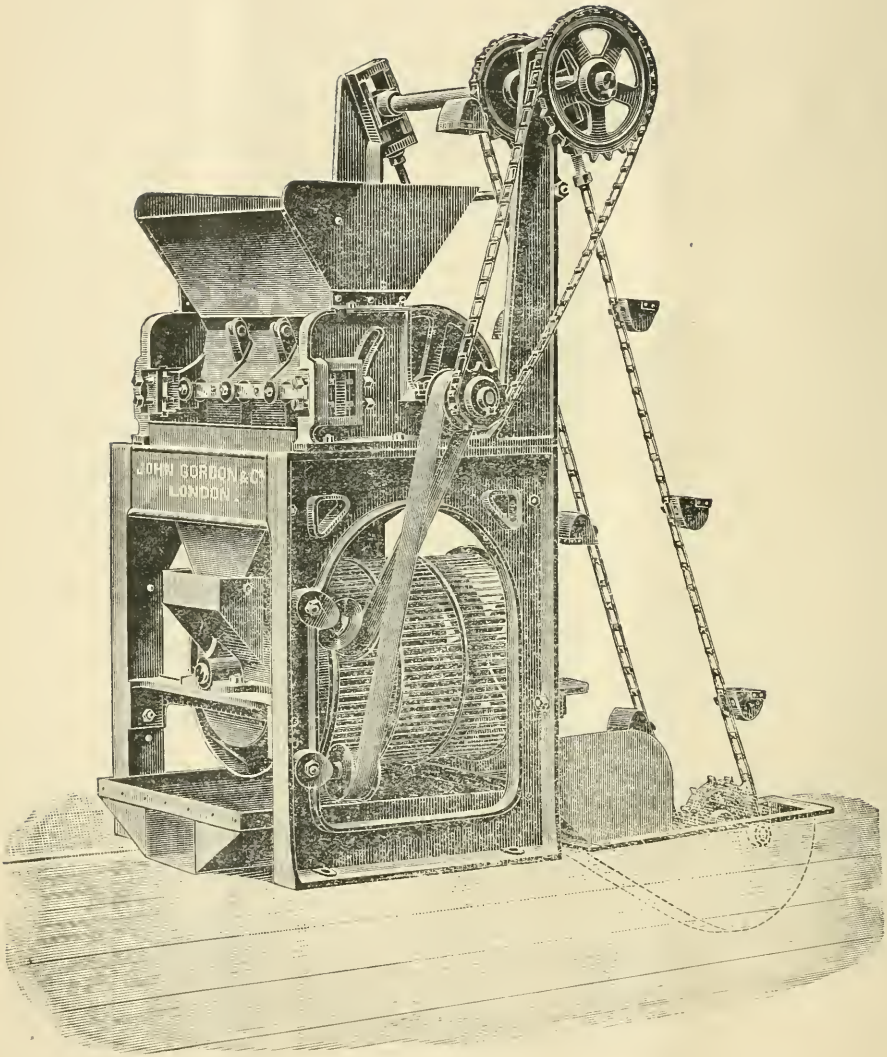

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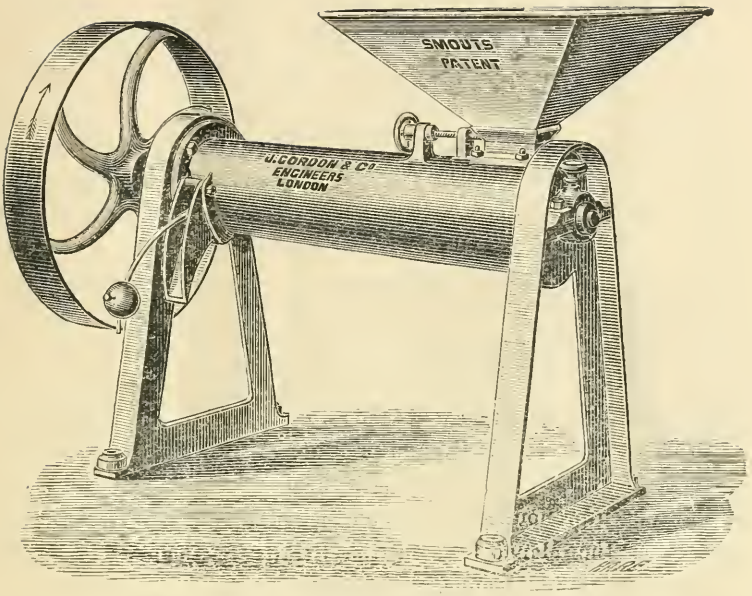

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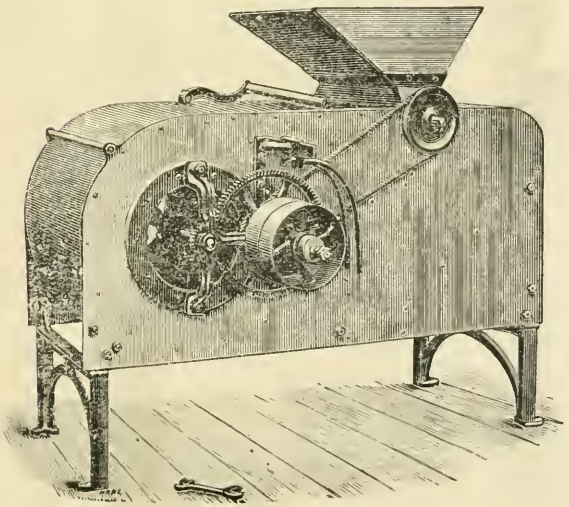


(No. 4.)

92.—"THE MANGOSTEEN."—*Garcinia Mangostana, Linn.*

The tree growing in the Royal Botanic Gardens, a notice of which has appeared more than once in Annual Reports and elsewhere, still continues to thrive and produce fruit.

It is, we believe, the largest specimen in existence in the Western World, being over 35 feet in height and some 40 feet in diameter in the spread of its branches. It first fruited under the care of my predecessor Mr. H. Prestoe in the year 1875, since which time it has fruited at irregular intervals, but generally during the later months of the year, commencing generally in September and continuing to ripen fruit daily for nearly two months.

The fruit produced by our tree is of excellent quality, and in September, 1891, a sample was taken to England by His Excellency Sir F. N. Broome, K.C.M.G., and presented to Her Majesty the Queen, who was pleased to say she found them "quite excellent." They have also been pronounced to be of excellent quality by several who have eaten the Mangosteen in the Straits Settlements, to which country they are indigenous.

The fruit seldom produces more than one or two mature seeds. These grow readily, but so far as we are aware, few trees have been established from them. Our experience shows that after appearing above ground the seedling grows freely for some one or two years, but afterwards generally assumes a sickly appearance and gradually dies out. We can only account for this by attributing it to imperfect fertilization; and it is quite possible that if two or three more mature trees were present this difficulty would soon disappear. This hypothesis seems to be strengthened by the fact that, seedlings received from the East (Singapore, &c.), grow very much better than those raised upon the spot, and we have one young imported plant which is doing well, and we trust will soon be beyond the dangerous stage. We are particularly anxious that it should be so, as it would be a great acquisition to secure regular supplies of such excellent fruit for our local markets. I have written a correspondent in the East to send me a case of these plants next year, so that we may be able to secure their permanent acclimatization—an object well worthy of the best efforts we can make.

Many West Indian residents are under the impression that this fruit is allied to the Mango, and we are often called upon to show the difference. The idea of course arises from the similarity of names, but the fruits are quite different, for instead of having a large seed in

the centre covered with fibrous material, the Mangosteen possesses a thick, brittle, bitter-tasting outer covering which readily cracks off and exposes a white pulp divided in quarters or "pegs" like an orange, which is the edible portion. A fact which speak volumes for the character of the fruit is, that among the many who have tasted it in Trinidad, not a single person has declared they did not like it, but all unite in singing its praises.

93.—THE MANGO.—*(Mangifera Indica, L.)*

Probably no fruit is better known throughout both the Eastern and Western Tropics than the Mango, *Mangifera Indica, L.*, and it is also probable that in no fruit known, is there a greater variety in the form and size and in the quality of the fruit.

The Mango was first introduced into Jamaica in June, 1782, being among a number of valuable plants taken in a French vessel bound from the East Indies and St. Domingo by Capt. Marshall of H.M.S. *Flora* attached to Lord Rodney's squadron. There being a great number of plants they were regularly numbered, and hence one of the most esteemed sorts became known as No. 11, which is still one of the best flavoured of all Mangos cultivated in the West.

The date of introduction into Trinidad is more uncertain, but it probably occurred somewhere about the same time.

Various kinds of Mango were also introduced to the French Islands, and some of these possess kinds of the highest value as dessert fruits.

My predecessor during the twenty-two years of his incumbency did much to bring forward the Mango by introducing the best varieties from neighbouring Islands, both French and British, and in 1880 wrote:—"During the year fifteen (15) varieties of grafted plants of "new varieties of Mango have been prepared and planted out per- "manently. The collection of Mangos of such as may be considered "fruitful as well as superior varieties, now numbers twenty-one."

He then complains of the unfruitfulness of the Mango as planted in the Garden, and certainly not without cause, in my opinion, as it is a fact that several trees which are believed to be specimens of the finest imported kinds, have not produced a single fruit during the past seven years, although growing with vigour and in good health, and we are thus quite unable to determine whether they are valuable or not. To one who has been accustomed to the fruitfulness of the

tree as seen in the various climates and soil of neighbouring Islands this is a curious circumstance, and can only be attributed to unsuitability of climate or soil of our garden. Throughout the Island however the production of the Mango tree generally is much below that of Jamaica and other Islands, but at times trees are seen which carry good crops. I am inclined to think that the deficiency in lime in our soil has much to answer for in this respect, and we are about carrying out experiments to test the matter fully. It has been noted in Jamaica, that the Mango, fruits much more seldom, and the crops are invariably smaller in the damp districts, and this result will also be evidence that our humid climate tells against the production of heavy crops by the Mango tree.

The idea that the deficiency of lime is one cause of the want of fruitfulness is further borne out by the fact that in town gardens where there is an accumulation of building rubbish and consequently lime, the Mango tree may be seen bearing good crops.

Notwithstanding these drawbacks the cultivation of the Mango is on the increase. Seedlings from the best sources or well-known trees of imported varieties are always on hand at cheap rates, but for those who prefer the named kinds, grafted plants in considerable quantity have been always kept on hand, and for these as well as the cheaper seedlings there is always a brisk demand.

The operation of grafting the Mango is a very simple although rather a tedious one, as the grafts have to be carefully tended daily for some months before they are ready for sale. The operation can be seen at any time on application at the Gardens and, if desired, will be explained in detail to enquirers.

Enquiries for seeds have been received on several occasions from persons living in the warmer portions of the United States, and a report on a consignment sent to Florida last year shows that a great deal is expected there from the cultivation of this fruit, and the success attained has surpassed expectation.

One word to the visitors to the West Indies. The Mango fruits in many places at abnormal seasons. These seasons are just those periods of the year selected by visitors, and the trees that produce fruit in this manner are generally the worst of their kind. This gives rise to the tale of West Indian Mangos being nothing but "tow and turpentine." Let the visitor however come in June and he will find Mangos that will be relished by the most delicate palate, and whose luscious sweetness and aroma, are things, once tasted, to be remembered for a lifetime.

The Mango may be transmitted to Europe in good condition if proper care is taken with it during transit, and if picked in the condition known to West Indians as "Full." The writer sent some home on one of the Royal Mail Steamers from Jamaica to Sir Joseph Hooker of Kew, in the year 1879. The variety sent being the celebrated though tender No. 11. They reached home in good condition and as Sir Joseph Hooker put it, completely disposed of the Tow and Turpentine theory.

There is always maintained at the Gardens a large stock of seedlings and of grafted Mangos of the best named kinds. Among which are Mango d'Or, Grand Verte, Gordon, Peter's, Prestoe's Choice, Puir Jamie, Peach, Belle Marie, Malda, and others.

94.—CIRCULAR NOTES.

Since sending to press the previous Number of the Bulletin, five "Circular Notes" have been issued by the Botanical Department. No. 10 had reference to a disease affecting Bananas which has been discovered to be caused by a fungus: and No. 11 was issued in reference to a specimen of cane which shewed a stage of the attack of *Trichosphæria sacchari* which had not previously been observed in the Colony, viz., the "Colletotrichum stage." Nos. 12, 13 and 14 treat of New Canes, Cola Nut, and the "Mosquito Worm" respectively. They are given in full.

Botanical Department, Trinidad.—Circular Note No. 10.

The cultivation of plantains and bananas has suffered considerable check during the past few years from disease or diseases which have been hitherto somewhat obscure as shewn in the Bulletin of this Department for January, 1894—No. 21.

I have lately had an opportunity of observing diseased plants more closely and continuously, and found among them specimens of a destructive fungus which I at once submitted to the authorities at the Royal Gardens, Kew.

Through the kindness of Mr. W. T. Thistleton-Dyer, C.M.G., Director, I have received the Report of the Pathologist Mr. Massee on the subject which runs as follows :—

"Banana Disease, Trinidad"—The fungus growing on the leaves is *Marasmius semiustus, B & C.* The numerous minute yellowish grains present in the tissue of the decaying portions of the leaf are the *sclerotia* of the fungus. Those propagate the fungus after a period of rest; but for this stage the fungus could not reach the axils of the leaves. Collect and burn all decayed portions.

(Signed) G. Massee.

24th August, 1894.

It has not yet been ascertained whether the disease which exists in many parts of the Island is in all cases identical with that discovered at the Gardens, but it is clearly shewn that we have with us a destructive pest which care and attention alone can eradicate, and it is quite probable that the other districts may be affected by one or more similar destructive diseases—but this requires further observation.

J. H. HART, F.L.S.,
Supt. Royal Botanic Gardens.

12th September, 1894.

BOTANICAL DEPARTMENT, TRINIDAD.—CIRCULAR NOTE No. 11.

During the year 1893 one of the experiments carried on in connection with the investigation of Sugar Cane Disease consisted of infecting a healthy growing Cane plant with the microconidia of *Trichosphœria Sacchari, Massee.*

The Cane selected was a healthy stem in which no borer or other insect enemies were present, and the system of inoculation adopted was simply to insert the spores into broken surfaces made for the purpose in the midrib of the leaf.

The Cane continued to grow apparently unaffected for some time, and eventually reached some six feet in length, but it gradually assumed on unhealthy appearance, lost its leaves and dried away into a shrivelled condition. In this state it was sent to Kew and the report on the specimen is appended hereto. It proves, on the spot' that the Fungus is capable of totally destroying a cane without the aid of insect agency of any kind.

"DISEASED SUGAR CANE FROM TRINIDAD.—Communicated by Mr. J. H. "Hart, August, 1894.

"The following phases in the life cycle of *Trichosphœria Sacchari* are present "in the cane.

"Conidial Conditions—1. Melanconium stage.
2. Macroconidial stage.
3. Colletotrichum stage.

"Ascigerous Condition.—In small quantity and accompanying it, perithecia "formed of purple polygonal tissue and enclosing large brown. 1—septate spores "not produced in asci—or stylospores. These structures have also been observed "united with the ascigerous form on canes sent from Barbados by Mr. Barber "and complete the usual sequence of phases in the life cycle of species allied to "Trichosphœria Sacchari."

J. H. HART, F.L.S.

13th September, 1894

Botanical Department, Trinidad.—Circular Note No. 12.

Through the kindness of Mr. G. S. Jenman, Government Botanist of British Guiana, we have received cuttings of a number of the best seedling varieties of Sugar Cane. These varieties have been on trial in the fields attached to the Demerara Gardens for several years past, and the best of the selection, so far as we can at present judge, are four canes known respectively as Nos. 102, 74, 95, 78. Of these canes Messrs. Jenman and Harrison in their latest report wrote as follows :—

"A comparison of the yields of Sugar in the expressed juice of "these canes, with that of the Bourbon in the same soil and during "the same year is interesting."

Taking yield of Bourbon as 100 we get following results :—

Bourbon	100
No. 102	110
No. 74	112·7
No. 95	118
No. 78	127·6

This result, if maintained, and we see no reason why it should not be, shows clearly that seedling canes are likely to prove better sugar producers than the older cultivated varieties, a result which was to be anticipated by the increased constitutional and vegetative vigour shown by the new kinds.

The canes will be propagated as rapidly as possible and then placed in the hands of Planters to test their suitability for cultivation on Trinidad Estates.

J. H. Hart, F.L.S.

20th November, 1894.

Botanical Department, Trinidad.—Circular Note No. 13.

Late advices show that dried Cola Nut is now worth in London from 1/- to 1/5 per pound.

Enquiries for this article have lately been received by the Government, and also by local Firms, from some of the largest European dealers.

It has been fully proved that the Cola tree grows well in Trinidad, and it is hoped that the increasing price will draw the attention of planters to the advisability of planting on a more extended scale.

A sample of this product grown and cured at the Royal Botanic Gardens has been valued in London (October) at 1/3 per pound.

The tree is easily cultivated, and thrives in the same soil and under the same conditions as Cacao.

Plants can be obtained at the Royal Botanic Gardens.

The curing of the product is very simple and inexpensive.

J. H. Hart, F.L.S.

24th November, 1894.

Botanical Department, Trinidad.—Circular Note No 14.

On Saturday, the 13th of October, I had brought to me a specimen of the Spiny Rat—*Loncheres Guiana*—which had been found feeding on a fruit tree in the Royal Botanic Gardens.

On examination the animal was found to be affected with the parasite, known in Trinidad as the "Mosquito Worm," whose life-history up to the present has been but imperfectly known.

The Rat was placed in a finely netted cage, and on October 22nd, or nine days after it was captured, the animal rid itself of the parasite, and the latter assumed the chrysalis stage, in one of the cage corners.

The chrysalis was a hard body, almost black, with nine segments, and in form slightly tapered to opposite ends. It was over one inch and a quarter in length, and measured five-eighths of an inch in diameter in its broadest part.

The chrysalis was kept in damp earth, and on December 3rd, the perfect insect emerged. The insect proved to belong to the Order Diptera or the two-winged flies—and it is among the largest of its class. It measures over one inch in length, and in spread of wing, nearly two inches, the body having the thickness of an ordinary lead pencil. The insect is to be placed with the *Œstridæ*, a well known family, parasitic on animals.

The puncture in the skin of the Rat on which the fly was developed healed in two or three days.

The Rat, the Fly, and the Cocoon from which the latter emerged can be seen at the Gardens.

The term "Mosquito Worm" is therefore proved to be erroneously applied.

J. H. Hart, F.L.S.

3rd December, 1894.

95.—CANE DISEASE.

It may be mentioned in connection with this subject that correspondence has recently reached us shewing that a Government Commission of Enquiry has been appointed in Martinique to investigate the nature and character of the diseases now affecting the Cane. Application was made to this department for information by the Director of Botanic Gardens at St. Pierre, and the course taken by us was to refer the questions to the representatives of the Sugar Industry, at the Meeting of the Agricultural Society. Replies have been received from prominent planters to the questions sent, and these it is intended to print in the proceedings of the Society, a copy of which will be transmitted to Martinique.

The attempt of the Agricultural Society to initiate concerted action among West Indian Colonies in securing a thorough investigation into the several diseases affecting the Cane and Banana; has not been supported to the extent expected, and Barbados is the only place which has expressed a willingness to unite with Trinidad in holding a conference on the matter. Some Colonies incline to the view that—although the cane disease is known to be present, a public investigation would cause a sense of insecurity in the future of sugar, which would not tend to the benefit of the planting interest. Whether they are wise in taking such a view, the future will reveal; but one thing is certain (viz.), that the presence of a destructive cane pest has been made known. Whether it has been recently introduced, or whether it has been present for years, are debateable points, and what is now required is, not only further investigation on this point, but well-concerted action, for, no matter how certain those persons may be who have studied the matter, as to the means to be adopted for its extermination, it requires something more to get such measures adopted; and the difficulty of doing so can hardly be comprehended except by those who are intimately acquainted with the facts, and the object in proposing to institute further enquiry, is believed to be, not so much the expectation of finding fresh facts, as with the view to emphasize the views already expressed as to the methods of treatment to be adopted. There are not wanting those among our planters in Trinidad who declare that no extreme measures are necessary, while on the other hand there are others who would gladly adopt any measure which promises success, but are unwilling to start alone. If the pest could be *proved* an old one, no extraordinary danger need be anticipated; but if new, the possibilities are truly alarming. The evidence so far,

is happily most in favour of the former theory, viz. :—That the pest is an old one which has been abnormally developed in recent years, but until discovered by us, unknown to science.

It may be the case, that this destructive Fungus only assumes serious development in some cases, and under certain conditions; and it is clear that further enquiry would tend to clear up such a point. It is not to be doubted that the disease is present in greatest force on those estates where continuous cultivation has been the rule, and where constitutional weakness in the cane plant, has been generated by such a course of culture.

As to Banana Disease—from Reports which have reached this office—the necessity for further inquiry is becoming daily more urgent, as the most prevalent disease now appears to be quite different from that mentioned in Circular Note No. 10.

96.—PARA RUBBER.—*Hevea Braziliensis, Muel.*

The tree known by the above name is one of those producing the article known in commerce as "Para Rubber" or "Caoutchouc," Fr.—Kautschuk, Ger. *Hevea guianensis, Hevea Spruceana* and *Hevea pauciflora* are also known as producing Rubber of the same class.

Our largest tree, whose age we are unable to ascertain, has a stem which at the ground line and four feet above, affords diameters measuring 22 and 15 inches respectively; the tree itself being some forty feet in height.

Para Rubber is second to none in the world's markets and realizes good prices. In European markets Para Rubber usually heads the list, and in October last the quotations of the "Public Ledger" were. Para 2/11¾, Colombian 2/6½, Central American 2/8, and Bornean 1/9 per lb.

Apart from its value as Rubber the tree promises to be useful as a shade tree for Cacao estates. The process of harvesting rubber is simple in the extreme, and was described in a late article by Dr. Ernst of Caracas, reprinted in our Bulletin No. 18, June, 1893. The tree mentioned as growing in the Royal Botanic Gardens is in extremely poor and unfertile soil, and there can be no question therefore of the suitability of our lands and climate for the growth of *Hevea braziliensis, Muell.* But the main question with cultivators and one we are the most often called upon to answer in such cases is—How soon will it give a return? This question we are obliged to confess we cannot answer with that accuracy we wish should always

attach to our reports, as we have no data to show the age of our trees, or when they were planted. It is clear however that the tree is a rapid grower, from the progress it has made during the past seven years, and the probability is that its age from planting does not exceed fifteen years. Such a tree is however capable of being made to yield a gross return of some 6s. per annum, and the calculation is an easy one for planters to ascertain what the produce would be per acre or per quarrée, supposing them to be planted as shade, or as a main crop. If planted for a main crop the trees would of course be planted very close, say not more than 15 feet apart, which would give some 193 trees to the acre, which at 6s. per tree gives a gross return of £57 18 per acre. The initial expense in planting is the largest outlay that would fall upon the intending planter, as after the trees reach a certain height, they would need but little cultivation, all that is necessary being to prevent any of the native trees overgrowing them, and to give them an occasional clearing of the under brush. Once formed, a forest of *Hevea braziliensis* would be a source of revenue to a planter very hard to equal, and probably not to be surpassed by any crop that could be cultivated.

What is most against the initiation of such a cultivation is the length of time to wait before a return is made upon the money invested in planting, and this is without doubt an unsurmountable objection to the many; but at the same time there is a rich harvest for those who can invest quietly and afford to wait for a return.

The Heveas are said to do best in a country where "the atmosphere is densely vapour-laden," and to flourish best on rich alluvial clay slopes by the side of running water where there is a certain amount of drainage; and those growing on land periodically inundated to a depth of 5 feet or more, are said to be more prolific, than those on very low, or on elevated ground.

I have given the case shortly, for and against, the planting of *Hevea braziliensis, Muell.*, and I am clearly of opinion that the balance of the argument is largely in favour of planting up suitable areas with these trees at the convenience of the planter, following the old advice—"to be aye sticking in a tree Jock." "It will be growing while ye are sleeping;" but if an investor has money at his disposal to plant up a large area and can afford to wait, I feel satisfied that he would be richly repaid by planting Hevea braziliensis.

97.—NATURAL HISTORY NOTES.

1.—"The Mygale," or Tarantula.

An interesting occurrence took place in our herbarium on October 22nd, 1894. A large spider commonly known as "The Tarantula," a species of "Mygale," was placed in the rooms for the purpose of destroying the numerous living specimens of the genus Blatta which unfortunately for us, so persistently make their home among our cabinets and shelves. The animal took up its residence on a shelf at the back of a volume of Brown's Natural History of Jamaica and spun a small white web. On the morning of the day in question it was observed hanging on the outside of the book cover, its legs and body covering a fair sized mouse which was partially covered with web. The head of the mouse was hanging downwards and the tail was twisted in a strand of the web connecting with the nest and pointing upwards. The spider was grasping the mouse at the back of the neck just behind the ears. The mouse appeared to have been but a short time dead when first discovered (7 a.m.) and had probably been caught during the night hours. The spider remained covering the dead mouse for the whole of the 22nd, and at night had reduced the head into a shapeless mass. Next morning the mouse was found on the floor, the head and shoulders mostly eaten away, but the intestines untouched.

These spiders are usually regarded in Trinidad with the greatest horror, but well authenticated records illustrating the dangerous character of the animal are wanting.

In the Gardens they are not allowed to be destroyed, the workmen being strictly charged to protect them whenever discovered, and to prevent others from injuring them; as it is practically certain that they do a large amount of good in ridding us of numerous destructive pests.

So far I have never seen anyone bitten by this animal, which in general inclination appears very timid and runs at the approach of danger; but it is possible, however, that if trodden upon or inadvertently squeezed it would then use its mandibles, and perhaps with considerable effect.

2.—A Forest Rat.—*Oryzomys velutinus, All. & Chap.*

This little Rat, caught in the Gardens by my son, proves to be one of the new species recorded as being captured at Princestown by Frank W. Chapman in 1893, and fully described in the Bulletin

of the American Museum of Natural History, Sept. 21, 1893. Probably a search in the woods of St. Ann's would reveal that it is not uncommon. Mr. Chapman records it as living beneath the roots of trees and stumps, and he obtained some eight or ten specimens of various ages.

3.—The "Mosquito Worm."*

It is commonly, though erroneously supposed by some that the "Mosquito Worm" is deposited by what is called the large Mosquito (probably a *Tipula* or "Daddy long legs") which is common in some districts.

I have in my possession a specimen of *Tipula*, which was brought to me by a gentleman from Cedros, as the veritable parent of the Mosquito Worm; but we have ample evidence that this insect has nothing in common with it; and has larva of an entirely different character.

On the 13th October a small Rat, the *Loncheres Guianæ* of Thomas, was caught in one of the Garden trees. In the side of the body of this animal and just over the hip bone was seen one of the well-known Mosquito worms. I say 'well-known,' for the larva stage is common, but no one appears to have followed the life history of the organism so far as to have been able to obtain the determination of the mature insect until the present experiment.

The Rat was kept in a cage under close observation, and on the morning of the 22nd October, or nine days after being caught, the larva of the insect was seen to have left the animal. A search in the cage brought to light the pupa of the insect esconced in a snug corner. This measured $1\frac{1}{4}$ inches in length by $\frac{5}{8}$ths of an inch in breadth at its widest part, and narrows towards each end, the anterior being the smaller, the head being distinguished by the occurrence of two distinct small yellow spots. The body has nine segments, and is encased in a hard and horny imbricated scaly covering—brownish black in color. In form the pupa may be likened to that of the common house fly, but very much larger in size.

The Chrysalis was kept in damp earth and on December 3rd or 42 days after leaving its host, the Imago left the coccoon, proved to be a large two-winged fly, having characters common to the Œstridæ, a well known family, parasitic on animals.

The specimens have been sent to an authority on this section of Natural History for determination, and we hope in a future issue to

* See Circular Note, December 3.

be able to publish the name of the insect. It is probable however that more than one species of this pest to wild and domesticated animals, exists in Trinidad, some of which attack the human body when exposed. A specimen of the latter was recently brought to me which was extracted from the knee of a young gentleman who had been traversing the country woodlands.

4.—A Beetle destructive to Orchids.—*Centrinus sp.*

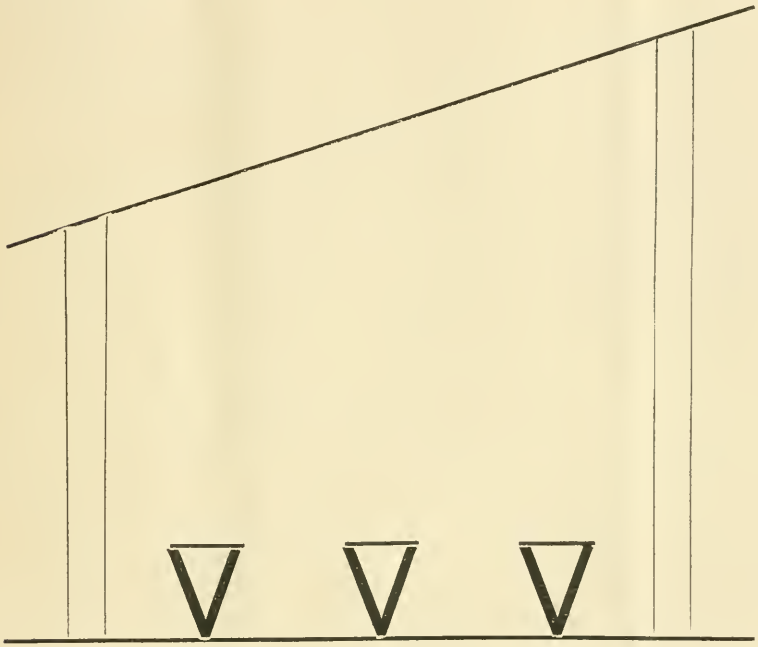
This is a very small dark colored beetle belonging to the *Curculionidæ* which is a large order, having as many as 200 sps. described in it twenty years ago, and it is probable that the members of the family now known have largely increased since that time. The insect in question was found upon plants of the well known *Diacrium bicornutum* so common in the Bocas Islands, Trinidad. It infested the leaves, and by its attack destroyed the even green colouring and rendered them rusty looking. When badly attacked the leaves died away. The best remedy found was regularly syringing with clear spring water, and hand picking the mature insect. The latter was found none too easy a task, for they are lively little creatures.

98.—CHRYSANTHEMUM.

Of the many species of Chrysanthemum known to science the general favourite amongst European cultivators is *Chrysanthemum Sinensis, Sabine,* by which appellation the Chinese or Japanese Chrysanthemum is botanically known. The shows of these plants which take place annually in the Temple Gardens, London, are of world wide reputation, and the cultivation of the plant is popular both with amateurs and professionals. These plants are grown by home cultivators in most cases without the aid of glass houses, and in cool and sheltered positions out of doors until late in the autumn when the occurrence of frost renders it necessary to give them protection. It would probably appear to those only accustomed to its cultivation in Europe, that the Chrysanthemum as a plant would be very unsuitable for tropical cultivation on account of the great heat it would have to encounter. This is the view, I must confess, I entertained for many years; but having seen plants flowering freely in the verandahs attached to dwelling houses in the Town of Port-of-Spain—and from a cultivator's point of view doing remarkably well—it was determined to procure a set of the best varieties from Europe for trial at the Gardens. Our first year's growth was a decided failure. Our second year we gave the plants more protection and we succeeded

much better. The third year, having ascertained by experiment the peculiar needs of the plant under tropical cultivation, we have succeeded beyond expectation and we have, at the time of writing, (Novr. 1st) probably the finest collection of Chrysanthemum blooms ever seen under a West Indian sky.

This gratifying success has been accomplished by the erection of a glass roof on posts for the protection of the plants in the following simple manner :—



Glass Roof on Posts for the Protection of the Plants.

The experience of preceding years taught us that the plant was unable to stand tropical rains, and that when given a sheltered position, plenty of light, and protected from wind, the Chrysanthemum may be grown to give a supply of blossoms sufficient to make it well worth the time and trouble expended on its cultivation. We have at the time of writing over 800 expanded blooms of different varieties.

The yellow kinds, as a rule however, have done the best with us so far, but there are several of the *Pompone* and other varieties which make a most creditable appearance.

It is singular to note that with a temperature such as we experience the usual flowering period of the plant does not appear to have

changed in the least degree, but that it still maintains its season of flowering the same as if it had remained in a temperate climate. If anything, the flowering season is likely to be of longer duration than in Europe, as it is there cut short in some cases by cold weather.

The culture of the Chrysanthemum has increased in Europe to an enormous extent of late years, and in some English nurseries it is said that as much as two acres of ground are devoted entirely to its culture. It is recorded that the first show of this flower took place in the city of Norwich in 1830 when nine varieties were shown ; while now, there are probably as many hundreds of varieties under cultivation. The prices of Chrysanthemum plants of the different varieties, range from 9d. to 3/6d. per plant in England—but some of the very finest, are charged at considerably higher rates.

In growing the plant, we find it necessary to give it a rich vegetable mould with plenty of drainage at the bottom of the pots or tubs, and to do the potting early in April or May. The early growths should be repeatedly stopped, by pinching out the heads with the finger and thumb, so as to induce a bushy growth, but after the month of July it will be advisable to let them grow on for the flowering stage. After this season all that is required is regular attention to the watering to keep them free from insects, and to support the growth with neat wooden sticks, so as to preserve the plant in good shape during the flowering period.

Plants can be safely imported to the West Indies in April and May, by parcel post from any British or Continental nurseryman, as they are then of small size and pack readily into suitable parcels for this kind of transit; and it should at the same time be remembered that it is far better to import half-a-dozen really good kinds, than a larger number of cheaper varieties.

99.—NICARAGUAN CACAO SHADE.—*Lonchocarpus sp.*

The seedlings of this tree were distributed during the month of October, and it is gratifying to us to be able to state that considerable interest was taken in the matter by our cacao planters, some having applied for the plants by the thousand. Our supply was, however, an extremely limited one, and we could only give a few for trial to each planter, and it is to be hoped we may receive in due course their report.

100.—THE "CASHEW" (Anacardium occidentale) AND POULTRY.

In number 24, article 79, there was published a few notes on the above tree. After reading the above a lady writes :—"I am inte- "rested in what you say about the Cashew, but do you know the old "superstition that if the nuts are burnt anywhere near young "chickens it will give them the yaws? I have seen rather convinc- "ing proof, and it is curious that the strong oil should be a remedy "for skin diseases. That it takes off the skin I have often found to "my cost when I was a child." Although not mentioned in Art. 77 we were aware of the old tradition mentioned by our correspondent, and our opinion is that it has some truth in it, and that it certainly deserves further investigation. The "yaws" in chickens certainly occurs at the same period of the year in which the cashew ripens, and poultry are attracted by the sweetness of the nut. What is more likely therefore that the blistering oil should so excoriate the surfaces, as to form a suitable lodgement for the germs of the infectious disease known as "Yaws;" the history and nature of which is as yet (so far as I am aware) undetermined. There can be little doubt that the disease is highly infectious and it has been known to appear in places where no Cashew were present; it is therefore not unlikely that it is due primarily to some other cause, but we consider it highly probable that the disease may be increased in its intensity and perhaps the infection carried to wider distances by the presence of the "Cashew." An effective remedy for the "yaws" on poultry of any kind is to daily dress the infected surfaces with Iodoform ointment, after gently cleaning away the dried scabs.

101.—"CASSAVA."

Under the above name are cultivated the Euphorbiaceous plants known to Botanists as *Manihot Aipi* and *M. utilissima*, which by some are considered synonymous. Mr. Fawcett of Jamaica in his "Economic plants" states that "there are a number of varieties according to colour "of stem and division of leaves. There is also one with a *non*-poisonous "juice in the root. But the plant generally known as *Sweet Cassava* "is without wings on the fruit and has a reddish root, (*Manihot Aipi* "Pohl.)" He further adds that—"*Bitter Cassava root abounds in a* "*milky poisonous juice and does not become soft by boiling or roasting.*"

And again—"*Sweet Cassava has a non-poisonous juice, has tough "portions in the centre, but becomes quite soft by boiling, and is eaten "like potatoes.*" "Cassava meal is prepared from both kinds. "Tapioca is prepared by heating the moistened starch of either kind "on hot plates."

Cassareep is the juice of Bitter Cassava roots concentrated by heat, which dissipates the poisonous principle, and this product forms the basis of the well known West Indian "Pepper-pot," as well as of many celebrated sauces and relishes. In Trinidad the subject of poisonous and *non*-poisonous properties of "Cassava" was taken up by the late Ernest Francis, Esq., Island Chemist, who published the results of his work in the proceedings of the Scientific Association of Trinidad. Mr. Francis records that, a paper was published by him in the London *Analyst* for April, 1877, showed the amount of prussic acid yielded by a number of different samples of Bitter and Sweet Cassava. This table gave the mean, highest and lowest percentages of fifteen (15) samples bitter, and ten samples Sweet Cassava as follows :—

Amount of Prussic Acid yielded by Cassava roots.

Sweet.		Bitter.	
Mean	·0168	Mean	·0275
Highest	·0238	Highest	·0442
Lowest	·0113	Lowest	·0132

Mr. Francis remarks that the samples indicated in the Table were obtained from as many sources as possible and care was taken to avoid substitution of one kind for another, and calls attention *to the discovery that the so-called sweet or harmless Cassava not only yielded Prussic Acid but the quantity obtained from it so nearly equalled that from the bitter that no line of distinction could be drawn between them.*

Many and grave are the doubts to which a record of this kind gives rise, and when we find it stated that, *there is also one with a non-poisonous juice*, the subject becomes one of further difficulty.

1st. It becomes fairly clear that, either we have not the true *non-poisonous* variety in Trinidad, or that Francis did not find it, or 2ndly. That there is over confidence in attributing *non-poisonous* properties to the Sweet Cassava.

To carry the investigation further I have written to Jamaica to try and obtain roots of the said "*non-poisonous*" kinds which will be grown side by side with those which are taken for Sweet Cassava here, from which experiment it is hoped a further light may be shed upon this most difficult question. It may be mentioned that the writer and his family suffered poisonous effects from eating what in Jamaica is

known as Sweet Cassava, and it is considered quite possible that poison will be found in the juice of that plant as known in Jamaica, as well as in the roots of the bitter variety, in the same way as in Trinidad. There can be no possible doubt that the manner of cooking has a very sensible influence on the presence or *non*-presence of the poisonous principle, as by the use of some methods the Bitter Cassava is said to be used as fearlessly as the sweet. The methods referred to are those which dissipate the peculiarly volatile principle of Prussic Acid, and thus render the starchy portions quite suitable for consumption, and this may be accomplished in the case of Bitter Cassava by frequently changing the water during the boiling process.

Francis gives the analysis of typical of specimens of each kind as follows :—

Bitter Cassava.		Sweet Casava.	
Water	62·07	Water	58·73
Sugar	2·67	Sugar	0·81
Starch	29·39	Starch	33·38
Fibre	2·01	Fibre	2·04
Salts	0·59	Salts	0·71
Fat albumen	3·27	Fat albumen	4·33
	100·00		100·00

The comparison of results in this analysis is very striking—especially so in the amount of fibre present. One of the distinguishing characters has been stated in public to be the amount of fibre present in the root ; but it is clear if the analysis is reliable, (and we have no reason to doubt it), this character is of little value. It will be safer for those eating of the presumed *non*-poisonous Sweet Cassava to be careful that it is boiled in two or three waters, as by so doing it will in any case be rendered perfectly safe, and should (as may happen) the poisonous kind be in any way substituted this method will remove the greater elements of danger.

102.—BERMUDA ARROWROOT.—*Maranta Arundinacea.*

In the annual Report of this Department for 1892, the subject of the growth of "Arrowroot" was discussed. It was shown that the variety growing in Trinidad previous to 1892 was a very unproductive one, and that since the introduction of the St. Lucia variety good starch and in paying quantity has been produced. Subsequently to this, plants were introduced from Bermuda, a place celebrated for the high quality of its arrowroot, and the product of these plants has been proved to be superior to any hitherto known in Trinidad.

The starch is characterised when seen under the microscope, by larger and more uniform cells than the other varieties. It will be our object to introduce the plant throughout the Island, as Bermuda arrowroot; as it is now clearly evident that starch excellent in quality and in quantity can be produced in Trinidad as well as in the more Northern Islands—a fact which has been previously doubted. A moderate quantity of roots can be had at the Gardens gratis by any planter who wishes to commence the cultivation.

103.—GUILIELMA SPECIOSA.—Mart.

Bactris Minor—Jacq.

The "Peach Palm."

This Palm which is according to the Kew list published in 1882, the *Bactris Minor* of Jacq., is a very interesting one in many particulars. Mr. Prestoe in his report for 1880 makes mention of having raised it from seeds contributed to the Garden by H. Darling, Esq., of *Lothian's* Estate, Trinidad, *in the woods of which Estate this Palm occurs wild.* The latter statement I have not verified, but it is certain that it is a plant whose range is wide spread. I have seen it on the Isthmus of Panama; on the Atlantic side of the Province of Veragua; and also in the Republic of Nicaragua. It is known, according to Seeman in his "Popular History of Palms" as the Piritu or Pírijao in Venezuela. The Pupunha of the Amazon district, and the Paripou of Guiana. It is commonly sold in a cooked state in the markets of the Town of Port-of-Spain under the name of Peewah, which may possibly be a corruption of its Spanish name. The plant usually bears two crops a year, one crop (that of October) producing nothing but abortive seeds, with a greatly enlarged fruit, and the other, producing small fruits containing little else but the hard fertile seed. The fruits of the October crop contain a large amount of nutrient matter suitable for human food, and are much appreciated by all classes native to the country, and even by visitors. They are eaten with salt after being well boiled.

The Palm thrives well in a poor soil, but is readily responsive to the application of suitable manure, and by its growth alone the productiveness of a soil may be fairly judged. If planted in a poor soil the plant developes few and weak stems, but in a rich soil its growth is abundant, its stems are more numerous and it soon assumes a heavy growth of luxuriant foliage.

This Palm, like others of its genus, throws up numerous suckers around the base of the first or seedling stem which, if left, also gradually form stems and the original plant becomes a large clump. In a good soil, the stems of such a clump will sometimes number twelve or more, of nearly the same height as the original, each with its own suckers growing to replace it when it shall have finished its course.

TRINIDAD.

ROYAL BOTANIC GARDENS.

BULLETIN

OF

Miscellaneous Information.

No. 2. APRIL, 1895. Vol. II.

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1895.

104.—A CURIOUS FREAK OF NATURE.

DURING the month of December, 1894, Mr. J. Graham Taylor called my attention to a curious growth of fruit on one of the smaller varieties of Banana known locally as "*Figue sucré.*" The plant was growing in a small garden in the Belmont district, and the bunch of fruit—much under ordinary size—was produced from the side of the stem about six feet above the ground; the plant itself being some twelve feet in height not including length of leaf. When the flower first appeared it grew in an upright direction and the bunch developed with the younger portion uppermost, contrary to the usual manner; but when the bunch approached the ripening period it gradually assumed the natural pendant position. It was at first thought that the protrusion of the flower from this point was due to some contraction or obstruction existing in the stem above the point of issue, which prevented its making its appearance in the usual way from the apex of the plant, but after ripening, the stem was examined and it was found that no obstruction was present, but that an open space existed of sufficient size to allow the escape of the flower stem in a natural manner.

It has therefore been concluded that the issue of the flower from the stem of the tree was caused by some injury having occurred to the stem at this particular point, and that the flowering parts appeared from thence as the point of least resistance.

A photograph was taken of the plant showing the position of the fruit upon the stem of the plant.

105.—CIRCULAR NOTES.

Circular Note No. 15.

For the past five years a regular account has been kept of the daily yield of the nutmeg trees under cultivation in the Royal Botanic Gardens. This was carried out for the purpose of ascertaining the proportion of the crop which may be expected during the successive months of the year. The following Table will, I believe, supply the required information. The annual rainfall for each year is also

appended, and it appears to show that the amount of rain has a striking influence on the total crop for each year.

Month.	Average yield per day.					Five years Daily Average.
	1890.	1891.	1892.	1893.	1894.	1890–1894.
January	151	41	81	46	20	65·8
February	180	53	120	184	19	111·2
March	250	283	75	370	145	224·6
April	159	478	165	398	671	374·2
May	421	443	240	403	505	402·2
June	527	136	758	588	201	442·0
July	473	145	691	358	260	405·4
August	445	160	405	511	508	405·8
September	341	162	264	531	223	304·2
October	121	125	173	546	88	210·6
November	33	101	81	63	51	65·8
December	46	45	40	31	116	55·6
Mean per month per annum...	262	181	257	335	234	...
Rainfall in inches ...	82·90	53·74	91·14	92·49	52·21	...
Mean daily average for five years ...	...	...	...	...	...	255·0

J. H. HART.

January 1st, 1895.

Circular Note No. 16.

During 1894 the Logwood trees growing on the boundaries of the Queen's Park were culled of dead and dying wood. The cleaned dye-wood from this cutting has recently been sold, and has realized prices 26/- above the quoted prices of best Jamaica wood, and nearly equalling best Honduras and Nicaragua marks, selling, as it did, at £7 16 per ton in Amsterdam.

The attention of planters has been called to the excellence of this product as grown in Trinidad on several former occasions, and I would again mention that there appears no reason why Trinidad Logwood should not become as famous in the future as Trinidad Cacao.

Logwood is essentially a poor man's cultivation, as it requires no capital to commence with; all that is required to start is to put out two or three hundred plants into ordinary land and leave them to themselves. Logwood however, responds to cultivation as well as

most other products, and the more attention it receives, the quicker it grows, and if such cultivation is well carried out a crop may be reaped in a very few years.

Seed may be had gratis in March of each year, and plants are always on hand at the Gardens at low rates; the seed must be sown as soon as ripe, for it quickly loses its vitality.

J. H. HART.

January 5th, 1895.

106.—PIPER OVATUM, Vahl.

"PUTT" OR "POUTT."

FROM the *Chemist and Druggist* of the 29th December, 1894, it is noted that joint papers were presented to the Chemical Society at its December meeting by Prof. Dunstan and Mr. H. Garnett. The subjects were—"The Chemical Constituents of *Piper ovatum*, Vahl," and "The Pellitory of Medicine," the latter paper having arisen out the work of the former.

Some interesting discoveries have been made, the full text of which will be published later,* but without anticipating it may be stated that a crystalline substance has been extracted from *Piper ovatum* "which possesses certain characters corresponding with piperine, to which it is proposed to apply the name of "*Piperovatine*." The physiological action is being studied by Prof. Cash of Aberdeen, and one of its properties has been found to be the production of spasmodic movements similar to those set up by the injection of strychnine. From the leaves a volatile oil was obtained containing a sesqui-terpene. The indefinite character of the active principle of pellitory, *Anacyclus pyrethrum*, D.C., induced the authors to re-examine that drug in view of the results they had obtained from *Piper ovatum;* with the result that they also separated from this plant a crystalline body to which it is proposed the name of "Pellitorine" should be given, forming the subject of the second paper.

Our interest in the investigation arises from the fact that the specimens of *Piper ovatum* were sent from the Royal Botanic Gardens, Trinidad, for special examination to W. T. Thistleton-Dyer, Esqre., C.M.G., Director of the Royal Gardens, Kew, by whom it was handed over to Prof. Dunstan.

In the Annual Report of the Department for 1890 I wrote the following :—

Piper ovatum has for many years the reputation of being possessed of medicinal properties, while to this day the hunters in the Trinidad forest use a

* Published March, 1895.

tincture of the plant to dress their dogs previous to starting on an expedition. It has a strong and pungent odour and when chewed leaves a peculiar deadening sensation on the tongue. It undoubtedly possesses peculiar properties, and well deserves the examination that is now being given to it. Cruger, a former Botanist, collected specimens of the plant, and Purdie in 1848 affixes to a specimen the following note :—

The root of the plant dried and powdered is used as a remedy for glanders and hydrophobia in horses and dogs.

It is said to be remedy also for the bite of venomous snakes.

As stated in the report referred to, the matter was first brought to my attention by the late Prof. Macarthy in 1888, and again by Mr. G. F. Bourne in 1890—and to the latter I was indebted for the collection of the first material sent. Later on a large batch of material was collected by Mr. C. W. Meaden at my request, and some was procured from hunters.

107.—SIMABA CEDRON.

This tree flourishes well in the Royal Botanic Gardens, growing to a height of 50 feet. It produces seed annually. The seeds are said by some writers to be useful as a febrifuge and we have on several occasions had enquiries for seeds in small quantities for medicinal purposes. Young plants grow rapidly from seed and can be planted in the open in ordinary soils. It is said to have been brought from the mainland by "Purdie" many years ago.

108.—SPATHELIA SIMPLEX, L.

This tree also grows well in the Gardens. It is known in Jamaica as "Mountain Pride," being very common on the sides of hills composed of the white limestone. It takes some 8 or 10 years from the seed to the flowering stage, but its large and handsome panicle of lilac-coloured flowers, once seen is not easily forgotten. The leaves are simply pinnate from 2 to 4 feet in length, and fern-like in appearance. When young, the plants are very useful for decorative purposes, owing to their fern-like appearance. When of mature size the plants reach to the height of 30 to 35 feet. They are seldom branched, and generally die away after ripening seeds from the first flowers produced. Seen on the hillside in their season they form a glorious mass of delicately tinted flowers essentially tropical in character. Those now growing in the Trinidad garden were raised from seed sent from Jamaica by myself, when in charge of the Botanical Department of that Island, in 1886.

109.—SABAL MAURITIFORMIS, Gr. & Wendl.

"The Carat."

To this name we refer a common palm of Trinidad. The tree grows to some 50 to 60 feet in height. The leaves are palmate in form, sub-orbicular, and the lobes are cut two-thirds of their length the entire portion being nearest to the leaf stalk. It is probably the same as that known under the name of *Sabal glaucescens*, Lodd. The under side of the leaf is glaucescent or whitish green. It is used in the country districts for thatching the houses of the peasantry, for which purpose it is very serviceable, cool and lasting.

We have in the Gardens specimens of a stemless *Sabal*, which seeds on pedicels the apex of which are not more than 4 feet high from the ground. The leaves, however, are very much smaller and stiffer, though much like in general appearance to *Sabal Mauritiæformis*, G. & Wendl. It is possibly the species referred to by Grisebach in his Flora, p. 514, under *Sabal*.

110.—COCCIDÆ, OR SCALE INSECTS.

In the December number of the *Agricultural Record* for 1892 I gave a list of species of the scale insects of Trinidad so far as they had then been examined by Mr. S. D. A. Cockerell. This list is now reproduced with recent additions found in the Royal Botanic Gardens, and elsewhere.

(1.) *Icerya montseratensis*, Riley and Howard. On *Clusia alba*. See Insect Life, IV., p., 407.

(2.) *Orthesia*, sp. incert., on Croton. See Jour. Trin. Field Nat. Club, 1892, p. 64. See also Insect Life, IV., p. 24.

(3.) *Orthesia prœlonga*, Douglas. On capsicum. See Ent. Mo. Mag., 1891, p. 247.

(4.) *Lecanium hemisphœricum*, Targ. Tozz. On guava. See Jour. Trin. Field Nat. Club, 1892, p. 65.

(5.) *Chionaspis citri*, Comstock. On orange and lime. See Jour. Trin. Field Nat. Club, 1892, p. 66. Insect Life, IV., p. 214.

(6.) *Chionaspis minor*, Maskell. On Pelargonium. (Collected by J. H. Hart.)

(7.) *Aspidiotus*, sp. incert. See Insect Life, IV., p. 24.

(8.) *Aspidiotus biformis*, Cockerell, n. sp. On *Epidendrum* and *Oncidium sprucei*. (Collected by J. H. Hart.) Scales dark; female scales circular or broadly oval, male scales much smaller, elongate, narrow. Female with three pairs of terminal lobes.

(9.) *Mytilaspis citrocola*, Packard. See Insect Life, IV., p. 214.

(10.) *Pinnaspis pandani*, Comstock. On *Pandanus*. (Collected by J. H. Hart.

(11.) *Ischnaspis filiformis*, Douglas. On *Pandanus*. (Collected by J. H. Hart.) See also Ent. Mo. Mag., 1889, p. 350, and Insect Life, Vol. II., p. 368.

(12.) *Planchonia oncidii*, Cockerell, n. sp. On *Epidendrum*. (Collected by J. H. Hart.) Scale yellow, with pinkish fringe. (Will be described more fully elsewhere.)

(13.) *Aspidiotus articulatus*, Morgan.

(14.) *Aspidiotus dictyospermi*, Morgan. Both in *Dictyospermum*. In Ent. Mo. Mag., 1889, p. 350, Mr. Morgan records them from Trinidad, but on pp. 352, 353, Demerara is said to be the locality. Mr. Morgan also records *Mytilaspis buxi* from Trinidad; this is the same as *Pinnaspis pandani* (No. 10 above).

(15.) *Aspidiotus destructor*, Signoret. On leaves of *Bassia latifolia*. (Hart.)

(16.) *Lecanium mangiferæ*, Green. On leaves of *Bassia latifolia*. (Hart.)

(17.) *Aspidiotus palmæ*, Cockerell. Jour. Field Nat. Club, p. 306, 1894.

(18.) *Chionaspis braziliensis*, Sign. ,, ,, ,,

(19.) *Lecanium oleæ*, Bern. ,, ,, ,,

(20.) *Orthezia insignis*, Douglas. ,, ,, ,, and Hart, [1895.

(21.) *Vinsonia stellifera*, Westwood. ,, ,, ,, and Hart, [1895, on *Stanhopea*.

(22.) *Lecanium depressum*, Targ. ,, ,, ,,

(23.) *Asterolecanium miliaris*, Boisd. ,, ,, ,,

(24.) *Diaspis lunatus*, Ckll. ,, ,, ,,

(25.) *Asterolecanium urichii*, n. sp. Ckll. ,, ,, ,,

(26.) *Inglesia vitrea*, n. sp. Ckll. ,, ,, ,,

(27.) *Pulvinaria pyriformis* n. sp. Ckll. ,, ,, ,,

(28. *Pulvinaria simulans*, n. sp, Ckll. ,, ,, ,,

(29.) *Icerya Rosæ*, R. & H. (J. H. Hart) on Amherstia.

111.—OREODOXA REGIA, Kth.

The "Cabbage Palm."

Several species of Palm are known as "Cabbage Palms," from the fact of their producing an edible portion at their growing points; but the Trinidad palm commonly used for this purpose is *Oreodoxa regia*.

It is a curious fact that when plants of this palm are grown in the more northern islands the stem assumes a pyramidal form which makes it rather conspicuous. In Trinidad it only assumes this form when planted on unfertile ground and under conditions where it becomes wind blown. The stem may in fact be induced to grow in various forms by suitable treatment, and the size of it can be reduced by starvation at one period, and enlarged by the application of manure at another period. If a plant grows in good soil in its younger stages with ample nutriment, the base will be large, but if as it grows the nutriment becomes exhausted, the plant gradually

decreases in the diameter of its stem from the bottom upwards, and if when this is seen to be the case manure or other nutriment is applied, the diameter of the stem will again become enlarged.

In some instances where plants of this kind of palm are sown naturally in thick bush, the seeds having been carried by birds or animals, the base of the stem will usually be small, as the plant in its youthful stages suffers from too much shade, from the effects of drought and from the abstraction of nutriment by other plants. When, however, it has grown above the surrounding bush and has well established itself, we see that the size of the stem increases, and afterwards, as the nutriment is exhausted, the size again gradually decreases, the trunk assuming a spindle-shaped appearance. This is also a well marked occurrence in another West Indian Palm known as *Acrocomia sclerocarpa*, Mart., and descriptive characters have been founded upon it which are of little value.

The "Cabbage" of *Oreodoxa regia* is an excellent vegetable when cooked. It may be eaten fresh as a salad, and it also forms one of the principal materials for making some of the best brands of West Indian "hot pickles."

112.—A SUNSHINE RECORDER.

Temperature in the tropics depends in a great measure upon the number of hours the sun shines daily. The importance of sunshine to planters is evident, and the degree of open sunshine experienced during the year is intimately connected with that of rainfall and temperature, which together go to form what is generally termed "the weather."

The importance of keeping a record of the duration of sunshine is seen when it is shewn that it enables the planters to estimate the causes of success and failure in the various cultivations, and I quote from the Report of Messrs. Jenman and Harrison of British Guiana on Agricultural Work for 1892–3, that our readers may see what estimate is placed upon such record by these well-known observers:

"Sunshine.—Next to Rainfall, or rather co-paramount with it, as success in agriculture and vegetable culture generally depends on the approximately near balancing of both—is the degree of open sunshine experienced in the year. Sunshine is never in excess providing it is accompanied by sufficient rain. Were it to rain only at night, of which we have experience in some seasons here, the sun might shine all day long throughout the year with advantage to crops. It is only in the final maturing processes during which the essential characteristic chemical changes take place, that an excess of sunshine over moisture is required."

Messrs. Jenman and Harrison are here referring principally to the requirements of the sugar crop.

It is well known that the season for the ripening of canes differs considerably in the Colonies of Trinidad and British Guiana, and the cause will probably be much more definitely shown when the record of sunshine is kept on similar lines, in addition to other ordinary meteorological returns. And it will probably be found that the canes are planted so as to ripen at the season of greatest sunshine, with dry weather.

To secure further comparison, the recording instrument has been selected of the same pattern and by the same maker as that used in British Guiana, and it is intended to keep a regular registry in future which will be published with our Monthly Meteorological Returns, so that planters will be afforded the means of making their own deductions as to the reasons for the different periods at which the sugar crop ripens in Trinidad and Demerara.

113.—THE BOTANY OF A TREE.

(Continued from page 304, Vol. I.)

In No. 24, p. 80, October, 1894, I promised to enumerate as far as possible the different vegetable growths which accumulate on the trunk and branches of one of our largest trees. In redemption of that promise the following list, which is far from complete, has been compiled :—

Rhipsalis cassytha, G.
Polypodium decumanum, Wild.
,, *vaccinifolium*, Fisch & Langs.
,, *incanum*, Sw.
,, *aureum*, L.
Anthurium lanceolatum, Kth.
,, *species.* (Palmatinerved.)
Epidendrum lanceolatum, Bradford.
,, *ramosum*, Jaxq.
Oncidium luridum, Lindl.
Polystachya luteola, Hook.
Catasetum tridentatum.
Ficus sp. (Narrow-leaved.)
Ficus sp.
Anguria ambrosa, Kth.
Cereus triangularis, Haw.
,, *peruvianus*, Mill.
Guzmannia tricolor, R. P.
Clusia species. (Large ovate-leaved.)
,, ,, (Small-leaved.)
Cedrela odorata, L.
Æchmea (?) *sp.* (?)
Tillandsia compressa, Berter.
Polyporus, sp. (Fungus.)
Musci. (Three or more species.)
Lichens. (Many species.)

Cedrela odorata was 10 feet high, growing on fork.

Cereus peruvianum on the upper side of branches in quantity, 6 to 12 feet high.

Æchmea species is in great quantity on branches.

Some roots of *Clusia* species are over 30 feet in length, hanging downwards in the air.

Anthurium lanceolatum is very abundant.

114.—NATURAL HISTORY NOTES.

No. 5.—The "Manicou," *Didelphys marsupialis*, Linn.—These animals are frequent visitors to our Gardens and annually destroy quantities of all kinds of fruit and seeds. They are especially fond of the fruit of *Flacourtia Ramontchi* or "Governor Plum," and also of the *Pomme Malac* or "Malacca Apple," *Eugenia Malaccensis*. They are also frequent visitors to the fowl roosts of the vicinity, and the screaming of poultry in the dead hours of the night is not an unfrequent occurrence for once in the grip of the animal a chicken has but little chance for its life. At some seasons of the year the animals are very numerous and do considerable damage, as many as eight or ten full grown animals having been destroyed in one week in the garden. The animal is a true marsupial, and carries its young in a pouch like the Kangaroo of Australia. Our local readers are of course conversant with the habits of the animal under discussion, but some of our correspondents abroad to whom our bulletins go in exchange will learn perhaps for the first time of a depredator with whom every Trinidad cultivator has, more or less, to count.

No. 6.—"Manicou Gros Yeux" or "Manicou Big Eyes" is another animal which preys upon our fruit, although in much less degree than its larger brother. This animal has lately been named by Mr. Oldfield Thomas from a specimen sent home from the Gardens to the British Museum in 1891 as *Didelphys trinitatis*, Thomas, (new species) as it has been found to differ in considerable degree from a similar species found upon the mainland. Our animal is about the size of an ordinary rat, and is curious and ungain looking. It is especially fond of the fruit of the Mango, from which it eats a small piece of the ripest side while hanging on the tree, thus causing the loss of numerous fruit. From the proximity of our Gardens to wood lands we are much more subject to the inroads of such visitors than on estates where a large extent of cleared ground exists on the outskirts.

Another species much resembling *D. trinitatis* but much smaller, named *Didelphys murina*, Linn., has been captured in the neighbourhood of Princes Town, but has not yet been seen within the boundaries of the Gardens.

No. 7.—*Actinopus scalops* is the name of the common "Trap-door Spider" of the Botanic Gardens. This is a source of much interest to visitors from the curious construction of its nest.

No. 8.—Under the name of *Pseudidiops Hartii* Mr. Pocock of the British Museum, (Vol. XI, Ann. & Mag. Nat. History,) has described a "Tree Trap door Spider" found in the vicinity of the Gardens. It builds a beautifully constructed nest so covered with lichens as almost to render it indistinguishable from the bark of the tree on which it is found.

No. 9.—Another large spider common in the Garden, which may be readily known by its resting with its legs in pairs in the form of a St. Andrew's Cross, is known as *Argiope argentata*. The cocoons shew a remarkable variation in colour, which varies between bright green and yellow.

115.—ARISTOLOCHIA GIGAS, var. Sturtevantii.

A PLANT which was received from Kew in 1893, has lately produced a numerous succession of flowers. These flowers are some twelve inches or more in width and some fifteen or eighteen inches in length, with an appendage or tail some two-and-a-half or three feet long. The peculiar fœtid odour of this class of plant when in bloom is well maintained by the one under review, so much is this the case that it attracts flies in the same manner as carrion. The flower itself is very handsome, and is like in many respects the native *Aristolochia grandiflora*, Sw., but about four or five times the size. Our plant promises to produce a supply of good seed in due course.*

116.—FLOWERING OF THE BAMBOO.

"BAMBUSA VULGARIS," SCHRAD.

IT is a very rare and unusual thing to find the Bamboo in flower or fruit in the West Indies.

In the East Indies the fruit of the Bamboo is sometimes used for

* A fine supply has been harvested.—April 2.

food, and the composition of the husked grain is given by Prof. Church in his "Food Grains of India" as follows:—

Water	11·0
Albuminoids	11·8
Starch	73·7
Oil	0·6
Fibre	1·7
Ash	1·2
	100·0

It is said that in 1864 the Bamboo furnished food for upwards of 50,000 persons in Kanara in 1864, and that in 1812 in Orissa a general flouring of the Bamboo prevented a famine.*

Our plant is now in flower (January 26th), but it remains to be seen whether it will ripen its fruit in our climate. It is a general idea that the fruiting of the Bamboo is the harbinger of an extremely dry season, but as the flowering is not general among the plants, perhaps this will not apply.

The plant or rather the stems die out after flowering, and the clump is wholly renewed by young shoots from the base.

The larger number of the stems of the clumps now in flower were cut away in November last, to provide fencing for the Race Course, and only a few mature centre stems remained, and it may be that the letting in of light and air to these is the cause of present abundance of flower on this particular clump. Other clumps near by, which were not touched, have shewn no sign of flowering at the time of writing. During twenty years continuous residence in the West Indies I have only seen the Bamboo in flower on two previous occasions. In Jamaica in 1885, in Trinidad in 1887, and the present instance, 1895.

117.—OUR GARDEN SOIL.

My immediate predecessor Mr. Prestoe on several occasions drew attention in his Reports to the inferior character of the soil of the Royal Botanic Gardens. While the position of the Gardens is an admirable one in every other respect, we are considerably hindered and placed at great disadvantage in many cases in the cultivation of various plants by the inferior character of the soil, and especially so by the character of its subsoil. One practical lesson is however apparent. It is this—that if plants thrive in our poor and barren

* "Food Grains of India."—Church.

soil, it is patent that they be expected to do far better when placed in a soil of good quality. Compared with the soil existing in the Botanic Garden, Grenada, our soil is practically barren. There, a surface soil exists which is highly fertile to a depth of three feet or more; while with us the surface soil is fertile only some four or five inches in depth, and below this we have nothing but an iron clay almost destitute of ordinary plant food. I have lately obtained the opinion of an eminent geologist on the latter, and the substance of his Report is as follows:—

This is a dark red of chocolate-coloured powder, among which are disseminated pebbles of slaty rock often of very fine grain with the materials disposed in thin laminæ. This soil consists of the débris of micaceous and slaty rocks. It is composed chiefly of silicates and iron. Silicate of alumina is abundant, and iron exists in various forms, *e.g.*, *silicate*, *carbonate*, etc. Mica abounds in minute scales. Lime only exists as a silicate. Graphite is distinguishable in the pebbles, and there are some angular grains of quartz.

This soil is an extremely poor one, and it is only in a climate like that of Trinidad that anything but the scantiest vegetation would grow on it.

As it has not been possible to ascertain that the characters of the soil have ever been determined by chemical analysis, permission has been obtained from the Government for an examination to be made by the Government Analyst, which, will probably afford further information and thus enable the Department to initiate an improved course of culture for the various sections.

Success has in many cases it is true, attended the efforts made to render the soil more fertile, but such results cannot be obtained except by the expenditure of a larger amount of labour and manure than would be requisite were the soil a fairly good one; and it must be confessed that in some few instances the staff is too heavily handicapped, and cultivation has not reached a standard such as the modern cultivator is ambitious to arrive at.

In a former number I mentioned the unproductive or unfruitful character of the Mango trees of the Gardens, but that was only a single instance, and might be easily multiplied many times over; and we might also mention the fact of the deaths which often occur among our cultivated and introduced trees as another instance of the unfertile character of our soil, as it is clear such deaths are in the main to be attributed to its barren character.

With such difficulties before us, in the form of a poor and unproductive soil, it is not to be wondered at that failures will sometimes occur, and we owe it to ourselves and to the community by whom the Garden is supported, that the reasons for such results should be fairly and fully stated.

Our soil is what is known to the general cultivator as "a hungry soil, *i.e.*, it will take up an almost unlimited supply of ordinary manure, the effect of which disappears in an extremely short space of time; and the difficulty of procuring frequent supplies of such, is one which has to be overcome, ere crops can be reaped and plants in general be made to put on a well cultivated appearance.

In the course of time much may be done to render the tillable area of the Garden more fertile, and it is hoped that when its constituents are fully known from mechanical, chemical and cultivator's analysis, measures may be devised which will render it much more productive than it has ever been during past years, and enable us to grow our plants with better results.

It is quite true—as mentioned by our geological friend—that it is only in a climate like Trinidad that our soil would produce anything "but the scantiest vegetation," and it is a fortunate circumstance that we are blessed with a climate which enables our plants to make the most of the food which is available from atmospheric sources, and upon which they in a great measure depend to carry out the ordinary functions of growth.

118.—ROSES.

To grow roses well in the West Indies, two things are essentially necessary. The first is a well sheltered but unshaded position; and the other a great depth of rich and fertile soil not occupied by the roots of trees or other gross feeding plants. Unless these two conditions are present, the return of the rose grower is but a poor one, and will hardly compensate for outlay upon plants. The conditions of climate render it impossible to grow those kinds of roses which in temperate climes are grafted or budded upon what is there a hardy stock, for it is certain that the stock used—either "Briar" or "Manetti"—is much more feeble in a tropical climate than the rose itself, and it is therefore much better to use plants which are as nurserymen term it, "on their own roots," *i.e.*, struck or propagated from slips or cuttings of the branches of the rose itself. Even when this is done, the kinds selected should be those which are known to be natives of countries having a warm climate, or have been raised by hybridization from such plants. What are known as Hybrid perpetuals are—in the main—of little use for tropical growth; although it is true there are a few notable exceptions. The Tea and Bourbon

varieties are without question the plants which are most permanent and give the best return of blossoms. Mareschal Niel stands pre-eminent as a tropical rose, but unless the soil is an exceptionally good one, it requires frequent renewal, *i.e.*, the plants gradually fail after about three or four years' growth, and will die out in that time unless the soil is carefully renewed.

In our collection of plants at the Royal Botanic Gardens, Trinidad, there is nothing that requires greater care than those sections devoted to roses. We have a poor and unfertile soil, and although a large quantity of manure is regularly used, we cannot possibly produce the same result as where a fertile soil naturally exists. From our diaries, however, it may be seen that our results are not insignificant, for, as many as 400 blossoms of Mareschal Niel have been cut in a single month, and other kinds in like proportion. We cannot, however, attempt to compete with the little Botanic Garden of Grenada in Rose culture, for there they have an almost inexhaustible soil well suited for rose growth, and plants become large bushes in as few months as it would take years to grow them here, and yet, as Mr. Broadway, the Curator, who was formerly Assistant Superintendent in Trinidad, says—"They don't get half as much attention as they do in Trinidad."

Roses planted in newly made ground yield a rich return in blossoms for the first few years in Trinidad Gardens, but in the long run the soil becomes exhausted, and the beds have either to be renewed entirely or a new plantation has to be formed elsewhere. Our experience is not singular, but on the contrary, in the neighbourhood of Port-of-Spain it is a common condition of affairs, especially where the same class of soil exists as at the Gardens. It is no uncommon thing for residents in the vicinity of Port-of-Spain to produce a fine bloom of roses—of which they are not a little proud—provided they have a newly planted garden with fresh soil; but the time surely arrives when the reverse is the case and they seek for advice as to what is to be done, and the only remedy we can supply is —manure heavily, procure new plants, and provide fresh soil. In rose culture generally the rose tree should be allowed to grow quite strong before blossoms are allowed to be culled from it, as nothing *so surely weakens the plants as continuous cutting*, and plants can never become good flower-producers if they are allowed to be cut daily. Roses, like all other plants, should be allowed a period of rest, and this can best be given in the dry season, and during this period all blooms, as they appear, should be removed in the bud with the

view of throwing the strength of the plant into its vegetative organs, so as to produce wood which will afford a more abundant supply of bloom in the following season.

119.—YAMS.

Our crop of yams was harvested in February, and the results were nearly equal to last year's return. Last year our return was 0·68 lbs. per square foot or thirteen tons to the acre, while this year our return stands 0·63 lbs. per square foot which is slightly less.

In addition to the Barbados "Water Yam," which was the variety grown last year, we have been successful in procuring several other varieties from Jamaica, St. Vincent and Demerara, some of which have proved of excellent quality and far superior to the Water Yam. The varieties are named as follows:—"Negro Yam," "Yellow Yam," "Afoo or Afou Yam," Horn Yam," "Buck Yam," "Cush-Cush," "Snake Yam," "Barbados White Yam," "Dominica Yam," "Devil Yam," and one or two other unnamed varieties. The heaviest weight of "Negro Yam"—one root—was 30¾ lbs. "Yellow Yam" gave roots weighing 11 lbs.; "Afou" 14 lbs., and "Devil Yam" 20 lbs. to 25 lbs. The "Buck Yam" is an excellent variety and splendid for table, but does not yield a heavy return. The "Yellow Yam," which is the same as the "Dominica Yam," yields an excellent table dish. The "Negro" and "Barbados White Yam," the "Horn Yam" and the "Snake Yam" proved to be of excellent quality, and superior in many respects to those commonly grown in Trinidad. It is intended to extend the notes upon this subject in a future number when the question of the nomenclature of the various kinds will be fully discussed. At present for convenience, the various kinds are termed *varieties*, but there are three if not more distinct species included under this term. A plant received during the year under the name of *Dioscorea sp.* proves to be a yam of poor quality common here under the name of "Cut and throw away." In common with several other varieties, it produces ærial tubers on the vines generally from two to four inches in diameter.

120.—THE GARDENS ORDINANCE.

The Royal Botanic Gardens Ordinance of 1894 has given power to make Rules and Regulations for the proper management of the Gardens.

1. The public portion of the Gardens is 41 acres, 0 rood, 6 perches in extent.
2. The private grounds attached to the Governor's residence, 9 acres, 3 roods, 24½ perches.
3. Private grounds attached to Superintendent's residence, 2 acres, 3 roods and 39½ perches.
4. The enclosures reserved for administrative purposes, 8 acres, 2 roods and 32 perches.

The total area of the whole Botanic Garden is 62 acres, 2 roods, 22 perches. A Plan of the same is deposited in Office of the Crown Lands Department, and one may be seen at the Gardens' Office at any time during office hours.

Regulations have been made under the Ordinance which are similar in character to those adopted by such Institutions in all parts of the world: these have been published in the *Royal Gazette* and may also be seen at the Gardens' Office at any time.

121.—THE "COHUNE" PALM.

"Attalea Cohune," Mart.

Our first acquaintance with this palm was in the grounds of a private residence situated some two miles above the site of the Public Garden at Hope, Jamaica, in 1876. The specimen was a fully developed one standing some 70 feet in height, and bearing an abundance of fruit. In Bulletin No. 6 I published the weight of a bunch of fruit taken from one of the trees of Trinidad Garden as 287½ lbs., and the number of fruit on the bunch as 2,203, and in Bulletin No. 12 I reported having found the palm common in the Island of Tobago. It is also indigenous to Trinidad, and is found generally through large portions of Central America, where it reaches immense heights. The tree bears a fruit about three inches in length and one-and-a-half inch in diameter, ovate in form, with three ovules in each. As in the coconut, however, it is found that in some cases only one seed is present and occupies the whole interior. Attempts have been made to extract the oil from these seeds, but although it is of good quality, the proportion yielded is too small to pay for extraction, which is peculiarly difficult owing to the indurated character of the shell which surrounds the kernel.

122.—"KOLA."

"Sterculia accuminata."

The latest reports shew renewed enquiry, and increased prices for this product.

123.—EUCALYPTUS USELESS AGAINST MALARIA.

"Under the heading 'The passing of the Eucalyptus,' the *Journal* "*of the American Medical Association* states that the Consuls of the "United States in Europe report unfavourably on the supposed "virtues of Eucalyptus. The Trappist monks of Tre Fontane, three "miles from Rome, have planted since 1873 no fewer than 50,000 trees "on a few acres. In 1880 the Government established an agricultural "colony of penitentiary convicts in quarters supposed to have been "already improved by the eucalyptus. The convicts were surrounded "by hygienic conditions far superior to those of the labourers of the "Campagna, yet nearly all became stricken with malarial fever within "a year after their arrival. In 1882 all the inhabitants of Tre "Fontane were attacked. The guards at the colony had all to be "changed. The efficacy of the eucalyptus for the improvement of the "air is no greater than that of the elm, pine, and mulberry. If it "recommends itself by rapidity of growth, the trees just mentioned "recommend themselves by being hardier and more easily grown. "Professor Liversidge, of the University of Sydney, stated long ago "that in the Southern Hemisphere, where the Eucalypti thrive best, "there are forests of these trees where malaria is specially noxious. 'The tree itself is no ornament, the continually spontaneous peeling "off of the bark producing an unsightly effect."

The above was published in the *Daily News* of February 14th, 1895, and I give it for the benefit of my readers, as opposed to the general opinion now extant upon the subject. My own opinion upon the matter was given in No. 24, October, 1894.

TRINIDAD.

ROYAL BOTANIC GARDENS.

BULLETIN

OF

Miscellaneous Information.

No. 3. JULY, 1895. Vol. II.

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„ 138.—Asclepias Currasavica.—*Linn.* "*Red Head.*"
„ 139.—Lucuma Mammosa.—*Gr.*
„ 140.—Cyrtopodiun Andersoni.—*R. Br.*
„ 141.—Sisal Hemp.
„ 142.—Bougainvillea Spectabilis.—*Willd.*
„ 143.—Vitality of Seeds.
„ 144.—Coffee Machinery.

PRICE: TWOPENCE.

Edited by the Superintendent Royal Botanic Gardens,
J. H. HART, F.L.S.

TRINIDAD:
PRINTED AT THE GOVERNMENT PRINTING OFFICE, PORT-OF-SPAIN.

1895.

124.—BLETIA SHEPHERDI, Hook.

Of the four species of Bletia recorded by Grisebach, this is probably the prettiest and at the same time, the one most suitable for Tropical cultivation. The Orchid is a purely terrestrial one and thrives in the ordinary soil of the Garden, and responds freely to the application of stable manure. In the Floral section of the Royal Botanic Gardens we have a large bed containing some hundreds of this plant which is now (April 18th) in full flower.

It is probably a somewhat unique feature to see a bed of Orchids in bloom in the open air with over a thousand well expanded flowers at one time. The flowers are however not developed at one season only, but are produced at intervals, though in smaller quantities, at several periods of the year, and the plant consequently serves as well for securing a supply of cut flowers as for flower garden decoration.

125.—SUGAR CANE EXPERIMENTS.

At the instance of a Committee of the Agricultural Society an experimental plot has been prepared in the Royal Botanic Gardens where it is intended to carry out experiments with various kinds and varieties of Sugar Cane.

In November last we received from the Botanic Gardens, British Guiana, a consignment of tops taken from some of the best of the seedlings raised at that establishment, in all thirty-nine varieties.

We have besides these, the Caledonian Queen—and ten varieties of seedlings which we received sometime since from Mr. Bovell of Dodds, Barbados.

It is intended to test the value of these canes in our Trinidad climate and soil, to ascertain whether the result obtained from the various kinds in Barbados and British Guiana, can also be confirmed here—and for this purpose it is proposed to carry on the cultivation and examination of produce on similar lines, as it is being carried out in British Guiana, so that any result obtained may be more directly comparable, than would be possible if operations were carried on, in a different system at each establishment.

Several of the Demerara canes give most remarkable results, and in some instances these results have been confirmed by the Louisiana Experiment Station under Prof. Stubbs.

If it can be shown that similar results can be obtained in Trinidad, viz.: 1st a sugar yield of 27 per cent. over the usual yield from the Bourbon cane. 2ndly that the same weight of cane can be grown per acre, as is produced by the Bourbon, and that the cane itself is less susceptible to disease, than that variety; a step in advance of no little importance will have been secured and a step which must commend itself to the sugar planters of the Colony, and encourage them to put such canes into cultivation, in place of their old favourite the Bourbon. This cane will however be grown side by side with others, so that a direct comparison may be instituted between the results obtained from it, and from the other varieties.

126.—HERBARIUM SPECIMENS.

Whenever the name of any plant is required by correspondents shall always be glad to secure its proper determination for them either by our own efforts; or by sending it to well known specialists. The resources of the Trinidad Herbarium are daily becoming more useful for this purpose and our sets of local plants are year by year proving of greater service for this purpose.

"*In sending specimens of plants for investigation it is necessary to have good specimens of leaves, flowers, fruits, and roots, and in the case of bulbous plants, the bulb also.*

"*When they are sent from a distance it is best to prepare the specimens by drying them under pressure between the folds of absorbent paper, otherwise the parts shrink and break so as to be hardly recognisable.*

"*When the dried plants are sent they should be protected from breakage in the post by being enclosed between pieces of stiff card board. Packages weighing less than eight ounces can be sent by post free of postage, if addressed to the Head of this Department with the words 'On Her Majesty's Service' written plainly on the outside. Write the name of the sender also on the outside of the package. In the letter accompanying the specimens, state where collected, the date, and any other particulars of the plant, whether reputed poisonous, medicinal or useful.*

"*In addition to this I would state, for the information of correspondents, that the determination of the plants or specimens sent is always forwarded to them, provided that they keep for their own information a similar specimen with a duplicate number attached to it, corresponding to that on the specimen forwarded, as it is not always possible to return speci-*

mens from their being somewhat mutilated in process of examination. The name of the donor of any plant or specimen is always recorded in our books, and any particulars conveying information, which they may send, is always, attached to the specimen when filed in the Herbarium.

All information is always afforded to local correspondents at once by letter with respect to the name, culture or manufacture of economic plants, and the department is always glad to receive specimens of any plants—the name of which are unknown to the collector. In fact we have good reason for complaint that in this respect little interest is taken by residents in the truly Botanical work of our establishment.

127.—CIRCULAR NOTES.

Circular Note No. 17.

Determination of the "Mosquito Worm."

On the third of December, 1894, I issued a note on the life-history of a specimen popularly known as the "Mosquito Worm" occurring in a native Rodent, stated to be *Loncheres guianæ*, Thos. A further study of this animal shows that it would probably be more correctly identified with Messrs. Allen and Chapman's new species, *Loncheres castanea.*

The imago of the "Mosquito Worm" was sent home for determination and has proved of considerable interest.

It belongs to the family Œstridæ, to the genus *Cuterebra*, and has been determined, either the *Cuterebra Atrox* of Clarke, or a new species. Our species proved to be unrepresented in the British Museum collection, so that it has had to be provisionally worked out by the aid of literature alone.

A larva which was sent home with the first specimen taken by Dr. Lota from the knee of a young gentlemen was found to belong also to the *Œstridæ* but to the genus *Dermatobia*, and is stated to be in the second of the three stages through which Œstridæ larvæ pass before pupation.

It is reported probable that several species of *Dermatobia* attack man, but only two have been described up to the present time, from perfect insects, while of these only one was bred from the larva, and that was taken from a cow.

It is reported also that the larva sent is of the form known in Cayenne as the "*Ver Macaque.*"

Another dipterous insect sent at the same time, in general appearance similar to the imago of *Cuterebra*, proved to be *Acanthomera tabanina Thunberg.* Family *Acanthomerida*, but belongs to the order *Brachycera*, as does the *Œstridæ.*

A curious fact in connection with the identification of Diptera is, that in the majority of kinds the sexes may readily be distinguished by the fact that the eyes of the male nearly meet upon the forehead, while those in the female are widely separated.

J. H. HART, F.L.S.

February, 27th, 1895.

CIRCULAR NOTE No. 18.

A few instructions for the use of Watt's Asphyxiator, or the machine introduced for the purpose of destroying the nest of the "Parasol Ants."

1st. Clear all bush, grass, etc., from the neighbourhood of the nest and take note of the principal entrance.

2nd. Provide sulphur, brimstone, or sulphur paper, and a small supply of charcoal.

3rd. Place the charcoal in the combustion chamber and set it on fire, in the meantime turning the wheel of the fan. Now place on the top of the charcoal the fire-clay saucer, and as soon as this is hot throw in the sulphur, and insert the nozzle of the machine into the main entrance securing it with a little moist earth, then commence turning the wheel rapidly first seeing that the driving cord is sufficiently tight to turn the shaft or spindle of the blower.

4th. Do not cover any hole until the smoke has issued from it for a few seconds; when each in succession should be closed in quite tightly with soft earth or clay.

5th. Continue the blowing until the further points of the nest have been reached, then close up the main entrance and leave for a few hours. It is unnecessary to dig out the nest.

6th. If it is found that some of the ants were not at home, successive applications must be made until all are destroyed.

7th. The fire-clay pan should always be used to prevent waste of the sulphur.

8th. In walls or buildings it is better to use cement or mortar to stop the holes instead of earth or clay.

9th. The machine should be kept well cleaned, oiled, and painted with red lead to preserve the iron.

J. H. HART, F.L.S.,
Supt. Royal Botanic Gardens.

27th March, 1895.

CIRCULAR NOTE No. 19.

Primary Cacao Shade.

IN Bulletin No. 19, p. 4, 1893, I wrote as follows in describing the plants used for shading the Cacao tree in Nicaragua. The primary shade is formed by a shrub belonging to the Compositæ known as "*Carrisso*" probably a "*Clibadium.*"

Of this shrub I brought back with me from Nicaragua in 1893 in a case with Cacao plants, three rooted cuttings, one of which was cultivated for the purpose of producing flowers and seeds; while the others were reserved for propagating purposes.

In February of this year the cultivated plant produced its first flowers, and I received its determination from the Kew authorities during the present month (April).

It proves to be *Eupatorium populifolium* H.B.K., a plant indigenous to the region between South Mexico and Panama. It is used in Nicaragua as a primary shade plant for cacao and grows freely from cuttings 6 inches to 1 foot long made from the stem of the plant (with or without leaves) placed in the open ground. The plant grows some 12 or 15 feet in height and would be a useful substitute in Trinidad for the "Moko" or "Jumbi" Plantain for shading purposes, but it has at present no known economic value other than for this

purpose. It may however be found useful for those places where the "Moko" has been attacked by disease, and its usefulness as a shade plant for cacao destroyed. A limited number of plants raised from cuttings will be on hand for distribution at the end of the year, and if mature seed is harvested a further supply will be available later.

J. H. HART, F.L.S.,
Superintendent.

11th April, 1895.

CIRCULAR NOTE No. 20.

The Cane-borer Parasite.

THE discovery by Mr. Barber, late of the Leeward Islands Service, of a parasite fungus which attacks the "moth borer" of the cane fields has excited considerable interest in Colonies where the attack of this pest is prevalent. M. Giard a celebrated authority on this section of Natural History has named the parasite *Isaria Barberi, Giard*, and has proposed to cultivate the fungus for the extermination of the borer. It appears however that the organism is somewhat rare, and Monsieur Saussine, Professor of Chemistry, Lycée de St. Pierre, Martinique, at the instigation of M. Giard, inquires of me whether the organism has been seen in Trinidad.

So far, however, it has not been observed by the officers of this Department, and I should therefore feel much obliged to any planter who may discover it if he would send me specimens.

When attacked by the fungus the larvæ die and assume a mummified appearance, and, in some cases, it is said, appears to the naked eye to be covered with a matted or woolly covering.

Specimens may be safely sent through the post in small tin boxes.

J. H. HART, F.L.S.,
Superintendent.

11th April, 1895.

CIRCULAR NOTE No. 21.

Cordyceps Luntii., n. sp. Giard MSS.

BY the mail I received from M. Giard the determination of a fungus, found by Mr. Lunt on the larvæ of a beetle.

M. Giard writes that the new organism is in habit and appearance somewhat like *Cordyceps caloceroides, Berk and Curt.*, and certainly new. The fungus is a parasite which destroys the larvæ of a beetle belonging to the *Elateridæ*; possibly that of our common fire-fly, *Pyrophorus noctilucus., Linn.*

At my request Prof. Giard proposes to call the new fungus *Cordyceps Luntii., Giard* after its discoverer.

The interest attaching to this find is somewhat important as the study of the destructive parasites of insects is now shewn to be a necessity in all Agri-Horticultural work. The *Elateridæ* live upon plants and might become great scourges were it not for the natural enemies which are present in the shape of such organisms as that, the discovery of which is here recorded.

J. H. HART, F.L.S.,
Superintendent.

11th April, 1895.

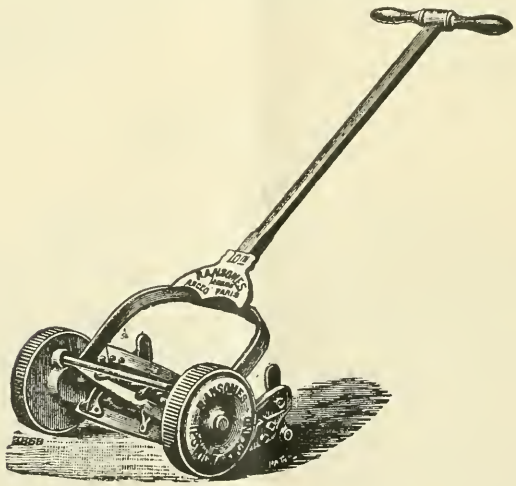
128.—LAWN MOWERS.

Applications are frequently made to us for information where to obtain the best Lawn Mowers for the all-round work of keeping in order, Tennis Lawns, Cricket Grounds, Golf Links, &c., &c. We have found that the machines supplied us by the firm of Messrs. Ransome's, Sims & Jeffries are very durable and effective.

A recent improvement in these mowing machines renders them still more fit for colonial use, for where skilled labour for working and for effecting repairs is hard to obtain, it is essential that the construction of the machines should be simple, and easily understood.

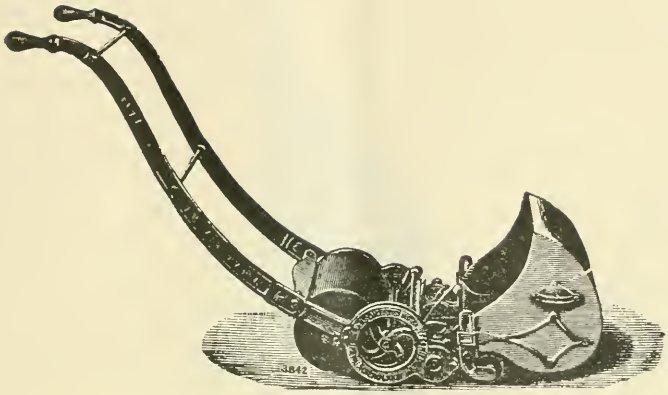
Through the kindness of the Firm I am able to give figures of some of their productions which I trust may be of service to readers of the Bulletin, and I shall be at any time happy to give further advice or assistance in the matter to any person who may require it.

We have had the 16 inch Paris and the 14 inch Automaton in use for several years—and we replace the cutting parts, bushes, &c., as required by orders on the makers, always maintaining a full set of duplicate parts on hand, so that we can replace a breakage at any moment.



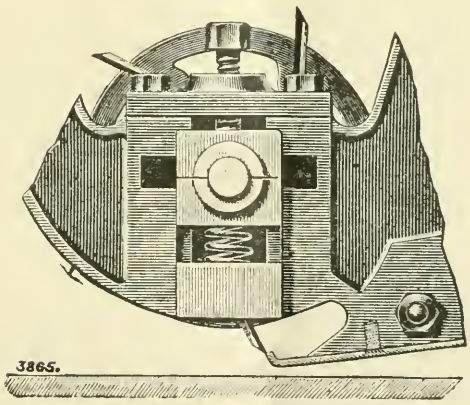
No. 1.—ANGLO-PARIS LAWN MOWER.

A suitable machine for small lawns and may be used very economically for larger spaces in dry weather.



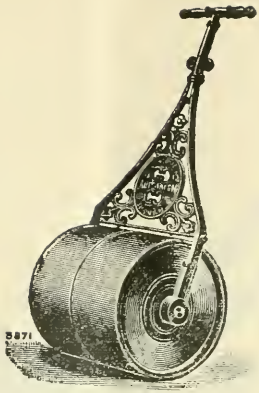
No. 2.—AUTOMATON LAWN MOWER.

An effective, durable and servicable machine for general use.



(No. 3.)

The above cut represents the latest improvement effected in the manufacture of Mowers. It sets the machine knives with one screw instead of two, and reduces the risk of breakage by inexperienced hands.



No. 4.—GARDEN ROLLERS.

For Walks or Lawns, with balance handle. These machines are made in two parts and are much less liable to breakage than the single cylinder roller.

129.—ACACIA SPADICIGERA, Cham. & Schlecht.

Known under this name, is a plant which bears curiously curved spines, produced in pairs. The plant is also known under the name of *Acacia cornigera*, Willd. The spines produced in pairs, resemble very much the different forms seen in the horns of various breeds of cattle.

Dr. Morris in his book on British Honduras states :—"The "spines on examination are found to be hollow, and probably have "been excavated by a colony of small ants which have established "themselves there. Critically noticed, a small aperture is seen on "the side near one end of a horn through which the ants pass in and "out. The other horn though hollow, has no aperture on the outside "and as the inside partition between the two horns has been removed "the ants have snug quarters which can very easily be defended. "During the wet season these holes are filled with ants which keep "guard over every portion of the plant especially against the aggres-"sions of the leaf-cutting ants."

"As the "Cockspur" being an acacia has numerous glands "frequented by the ants—they are not only securely housed but also "provided with a bowntiful supply of food."

It will be seen that the plant is known as the "Cockspur" tree in Honduras. It is also known as the "Bull Horn" Thorn. In Central America the plant is a very common one but it is but rarely seen in the West Indies. We have a single plant only in the Royal Botanic Gardens and this has not grown to a large size.

A recent visitor to the Island of Dominica brought a box of thorns to Trinidad from a tree found there and presented them to the Herbarium of the Royal Botanic Gardens—reporting that in Dominica the thorns is supposed to be extremely poisonous, and if the skin of a person be scratched by it, the results are said to be very serious.

However this may be in Dominica. In Central America there are thousands of acres of this tree, and a traveller cannot traverse the country without meeting with this formidable thorn.

In Nicaragua in 1893 I passed through pasture lands on which it was especially abundant, to the exclusion of other vegetation; and I was scratched frequently, on passing the trees without suffering any other injury than that which arose from the mere abrasion of the skin. The "Cowboys" of the country who ride half-naked through the bush, do not regard them as at all dangerous, and ride hard through thickets without the least fear.

A common instance of mutual dependence is often to be seen on these trees. High up on the tree will be a large black wasp's nest—the inhabitants of which are most vicious of its kind, and immediately below it the nest of one of the native birds. Thus there is the tree, the wasps, the bird and the ant, mutually dependent one upon the other for protection.

130.—HIPPOMANE MANICELLA.

"Manchineel" or "Manchioneal."

This tree has a reputation for the possession of poisonous properties which is not an enviable one. Many visitors to the Gardens who have read Mr. Froude's book on the West Indies make enquiries for this tree which he describes as being present—but I am obliged to inform them that it does not exist in the Gardens; in fact it will only thrive at, or very near to the sea coast, and must be sought for in these positions.

Barham, in his "*Hortus Americanus*" gives an account of its poisonous properties but these accounts are much modified by subsequent writers, and the general opinion appears to be that the tree is

not really so noxious as was made to appear. JACQUIN a French Botanist reports that "*he and his companions reposed for three hours under the trees without injury, and the rain dropping from the leaves is perfectly innocent.*"

Sloane who wrote in 1725, Brown in 1756, Barham in 1794, and Lunan in 1814, all make mention of the tree and its reputed properties.

The latter writes as follows:—

"The stories related of the fruit or apple of this tree are certainly "to be classed among vulgar errors. The romantic tales of the early "voyageurs and travellers into America have been copied by different "writers; and the credibility of their relations, thus built upon a "series of such frail authorities has at length been received as "authentic and indisputable." After relating several experiments, &c., Lunan concludes as follows:—

"It is plain from hence, that the tree and unripe fruit contain "an acrid juice which operates like other materials of a like nature, "exciting heat, irritation, and thirst, when swallowed and received "into the stomach, producing such a pungency on the throat, and "tender nervous cords exposed to its action, as greatly to disorder the "whole frame, and bring on very bad symptoms and sometimes death; "but that the juice when matured and concocted—as we find it in "the ripe fruit, loses much of its acrimony and though still "unpleasant in its operation upon the bowels does not produce mortal "effects."

Goats and Sheep are known to feed plentifully upon the ripe fallen fruit and suffer no injury from it.

"The wood makes very handsome furniture resembling wainscot."

131.—NATURAL HISTORY NOTES.—6.

Caccotrypes dactyliperda, Fabr. is the name of a small beetle which arrived in the Gardens in the seeds of a date (*Phœnix*) received from Calcutta. Professor Blandford states it to be a very well known inhabitant of dates and many other seeds of the Palmæ.

No. 7.—Habit of a Beetle.

In the neighbourhood of Port-of-Spain at certain times of the year, small holes are generally to be observed in any clear piece of ground uncovered by pasture. These afford great amusement to

children, who with a grass stem as their weapon, pry down these holes. On putting in the grass stem and watching it for a few seconds, it will be seen to move and if it is pulled out sharply on the instant with a sudden jerk; the larvæ of a small beetle will be also pulled out. This is known to be the larvæ of a species of "tiger beetle" family *Cicindelidæ* and genus *Tetracha?* but which particular species it is to be referred to we are as yet somewhat uncertain.

No. 8.—Coccidæ.

I recently sent some specimens of Coccidæ to Professor T. D. A. Cockerell who is a recognised authority on this class of insects. The following is his Report :—

"*Icerya Rosæ R. & H.*, Hab. At foot of Amherstia—a good addition to the Trinidad Fauna. It is common in Jamaica under the bark of Lignum-vitæ, and it is usually attended by ants. It was found on Amherstia also in Jamaica; *vide* Journal Institute, Jamaica, Vol. I." The male is unknown.

Chionaspis citri Comstock (a few larval Orthesia also.) I do not wonder you call this a pest. It was said to have caused dreadful destruction in Bermuda. — (See my article in Jamaica Botanical Bulletin.) Fortunately it is not yet found in Jamaica nor I think in the Lesser Antilles. I suppose however it will get there, sooner or later.

The record referred to states, that a vessel arrived at Bermuda in distress with a cargo of oranges, and in a few months afterwards the orange trees were covered with an insect which gave the trees the appearance of being white-washed. "Every device thought of was tried, but the Island was soon cleared of nearly every tree and all this came from the distress cargo." (*See Article 110.*)

It is therefore seen from the above that we have in our midst a dangerous enemy to the citrus tribe for it attacks alike the orange, the lime, the lemon, and the citron, &c. There is one thing to be said however, and that is—that the insect is known not to be a recent introduction, and it does not appear with us to spread at all rapidly. and though trees may be affected, yet they continue to grow fairly well, and to bear fruit. It is quite possible however, that the heavy rainy weather we experience at some seasons of the year, acts as a check upon the increase of the insect, and that unless trees are in poor health or in bad soil it will not destroy them. It is probably checked also in no small degree by one of the *Embidæ* which appears

to be its natural enemy. Still at the same time it must be confessed that it does materially affect the trees, and measures should be taken to destroy it. This may be done by syringing with almost any of the insecticides commonly used by the Horticulturist.

Among those recommended is the following :—

Kerosine Oil, 2 gallons.
Common Soap or Whale Oil Soap, ½ pound.
Water, 1 gallon.

Disolve the soap in water by heating, add the solution boiling hot to the Kerosene (Pitch Oil) and by means of a force pump or syringe, churn up until it assumes a creamy consistency; bofore using dilute this with cold water.

Emulsion, 1 part.
Water, 9 parts.

No. 9.—A New Ant.—*Azteca chartifex. N. Sp. Forell in litt.*

Among other specimens sent to European specialists an Ant bearing the above name was sent. This is one of the ants that appears to be mutually dependent on the scale insects for existence as they are always found in common. In this case the ant lives and nests on trees of *Bassia latifolia*, and others, in the Gardens.

No. 10.

Under the name of *Siphonorhinus Hartii*, Pocock. A myriopod new to science will shortly be described. This was found by Mr. Hart within the precincts of the Garden.

No. 11.

A short time since a single specimen of Peripatus was found by an employee, within the boundaries of the Garden, and was determined as *Peripatus trinidadensis, Sedgewick.*

During March this year Mr. Lunt discovered these animals in some numbers and subsequently more were collected, in all some sixty specimens—from which it appears that they are not such a rarity as has been supposed.

No. 12.

Vaginula occidentalis is the name given by the British Museum authorities to a (slug) recently found in the Garden. It is to be included under order *Heteropoda;* sub-class, *pulmonata* which includes "Land-snails, slugs," &c.

132.—THE ASPHYXIATOR.

THE machine previously mentioned No. I, Vol. II, p. 3—has now been introduced to the Colony and is doing good work in exterminating the common pest known to our cultivators as the "Parasol Ant" or (*Œcodama cephalotes*) and the sanction of the Government has been obtained for its use by the Wardens in several of our country districts. Instructions for using the machine have been issued from this office in the form of a Circular Note which will be found at page 56.

133.—DISEASE.

WHEN we speak of the diseases of plants it is to be understood, that disease means, an unnatural, unhealthy, or sickly condition induced by some cause.

The causes which produce disease in plants are perhaps as various as those which produce disease in the animal kingdom, but it must be accepted, as in that kingdom, that all disease arises from some known or unknown cause.

We frequently hear the attacks of parasites, animal and as well as vegetable, spoken of as disease, if they induce such a condition of health from their attack, as to set up enfeeblement of the tissue and ultimate destruction, but if on the other hand these parasites are merely common feeders upon already enfeebled tissue, then it is considered that to call such a condition, disease, and refer it to the attack of the organism, would be erroneous. In the latter case they are saprophytes, but in the former, parasites, or feeders on healthy tissue.

It is known to be an accepted theory with some, that the attack of animal organisms or plants is always the forerunner of *disease* appearing in some classes, and in like manner others, take an attack of vegetable parasites, such as the lower orders of fungi, to be *disease*.

A constant observation of the factors operating to bring about conclusions in these matters for over thirty years in temperate and tropical regions, leads me to think that the attack of insects may as certainly sap the vitality of a plant, as the attack of a cow upon a bundle of grass will destroy that plant—but it is evident that we cannot call the attack of the cow on the grass *a disease*, and reasoning by analogy; neither can you call the attack of the insect, disease.

If you bring a plant from a cold and dry climate to one which is warm and moist, the very surroundings of that plant are unsuitable

to it, and although it may thrive for a time by virtue of the actual vitality it possesses, it will in the long run be sure to succumb from the attacks of insect or vegetable parasites, which are invited by the weakness engendered by the unsuitable conditions with which it is surrounded.

Again, if you are forced to plant a tree on ground which is dry, when you know that it requires moisture, you at once invite the attack of any enemy which may be in the immediate surroundings.

If you plant on inland "*vegas*," trees which are native to the sea shore, you at once use the most certain means to induce a weak or unhealthy condition, and invite the attack of parasitic enemies.

If however your plants are known to be getting all they require in the way of plant food, and all they require in the matter of suitable temperature and moisture; if they are situated in a place where the surrounding conditions are favourable for their growth and are then attacked by parasites, in the majority of cases the parasitic enemy is out-done and overcome by the vitality of the trees and does not gain ground. If however there are unhealthy plants in the neighbourhood which allows of a rapid increase of the parasite the truly healthy may also become affected and be ultimately destroyed by force of numbers.

Some however make no distinction between such cases, and seek no other remedy than the destruction of the insect or vegetable parasite, and consequently fail to do any good work, for it would appear to be plain reasoning that it is really little use destroying the insect or organism, if the condition of the soil, the aspect, or the climate, are really unsuited to the growth of the plant, or if it urgently requires certain manurial constituants which are not present.

We hear of the Coffee leaf "*disease*," the Vine "*disease*," the Potato "*disease*," &c., &c. Now it is fairly certain that these "*diseases*" have always been present, and that their spread is entirely owing to the destruction of the balance of nature by the hand of man who throws together for his own ends, large areas under a single crop, and thus provides food for the ready spread of any destructive organism, and what was once but an organism of the forest, feeding here and there upon the weak and helpless, becomes at length a destructive agent, which is only after all—however it affects the planter—Nature trying to restore the original balance.

If we look at the history of all such outbreaks or spread of destructive organisms, we shall seldom find that what is commonly termed "a cure" has been found.

It is of course a well known fact that ignorant persons have brought forward "cures" for such. and as a rule the more ignorant the person, the more certain have they been that they had an "infallible cure." In the long run, however, it is seen that no "cure" has been made, and palliative or preventive measures are the only ones practicable, the real cure having to be looked for, by securing increased vitality in the plant, which may sometimes be accomplished.

With us in Trinidad the Sugar Cane has been attacked by parasitic fungi, and the evidence so far certainly goes to show that it is the neglect of precautionary measures in the disposal of infected plants which has conduced to the spread of this disease. What can be expected when it can be shown that planters have in some cases to trust to men, who will prepare "tops" for plants, which are in reality alive with fungus, as was seen in one of our best sugar districts on a recent occasion. These tops were certainly infested with the spores of *Trichosphæria*, and yet they were being used for planting, and would it not be hard to point to a more certain means for promoting the spread of such a pest than the use of such infected material? But it is known that many hesitate even yet to accept the scientific evidence of the danger of such a course, and continue cultivation entirely on old lines, and year after year, use contaminated plants.

Trichosphæria has now been fairly proved to have been once simply a *Saprophyte* that is to say, it found its sustenance on dead or decaying matter—but with the constant accumulation of rotten material left upon the fields it has gained such strength as to enable it to take on the parasitic form, and can now attack living canes—especially those which are weakened by any local cause, or have lost their constitutional vigour or vitality through the systematic adoption of continuous culture without change of crop on the same fields year after year; and it is quite clear that the remedy can only be found in inducing a larger amount of vigour in the plant grown, so as to enable it truly to throw off the attack of the parasite, and enable the cane to put on that original condition known as health.

The best possible means of procuring this desirable end at present appears to be after the destruction of all diseased material to secure those seedling varieties for field cultivation which are least susceptible to the attack of parasitic enemies, or in other words those possessing the greatest amount of "constitutional vigour."

In the case of parasitic attack "a cure" may often be effected when it is of a destructive character, (*i.e.*) where such is not induced by previous weakness; but if the attack has been invited by the

latter cause, nothing can avail until the vitality is strengthened, and the attack will regularly recur, until the causes which lead to such recurrence have been removed.

It is therefore necessary to ascertain the cause of a plant becoming "diseased" or enfeebled before any certain remedy can be applied—for it is patent that it would be quite useless to dress a Banana with Bordeaux mixture, if it was not attacked with fungus, or to treat it to a dose of insecticide, if there were no insect present; the trouble being really caused by unsuitable conditions of the soil or climate. If plants are really attacked by insect or fungoid pests it should first be ascertained whether these are of a destructive character, or whether the attack is induced by previous weakness or feebleness arising from other causes, and until such a course is taken remedies can seldom be applied with good effect.

134.—SMILAX OFFICINALIS.—*Kunth.*

"Sarse," or "Sarsaparilla."

The product of this plant is generally known under the name of Jamaica Sarsaparilla on account of its being formerly shipped to England from Central America *via* Jamaica ports. The plant likes a good rich soil, and should be planted near to trees upon which it can climb. The root is the official part of the plant. A large quantity is annually collected from the woods of the interior of Central America being principally brought down to the coast by the Indians, by whom it is exchanged chiefly for clothing with the traders or merchants of the coast ports. The plant thrives well in Trinidad and could be largely grown if the prices offering were such as to encourage its cultivation. The plant thrives in the Royal Botanic Gardens, where it may be seen at any time. The root gives little trouble to harvest, and can be prepared for market in two or three days, in dry weather.

135.—ARTHOSTYLIDIUM PRESTOEI.—*Munro.*

Native Bamboo.

This plant was first discovered by my immediate predecessor Mr. Prestoe after whom it was named by the late General Munro. It was re-discovered in the St. Ann's hills by my late Assistant Mr. Broadway, in 1892. Plants flowered this year in the Gardens which enabled us to secure good Herbarium specimens and I am indebted to the Kew Authorities for the correct determination of the plant.

136.—AVERRHOA CARAMBOLA.—*Linn.*

This tree grows to a height of 30 feet in our Gardens and fruits annually in profusion. The fruit when fully ripe is a very useful substitute for green gooseberries and can be made into tarts—the flavour of which is scarcely to be distinguished from that of the gooseberry. It has been found that some trees produce fruit which have much less acid than others, and these are often eaten in a fresh state with considerable relish. The fruit is known locally as "Coolie Tamarind." Our trees appear to have become thoroughly acclimatized.

137.—PARMENTIERIA CERIFERA, D.C.

"The Candle Tree."

The "Candle Tree" is one of those which always attract the attention of visitors, when in fruit, owing to the numerous candle-like yellowish green fruits which it produces. It fruits annually at the Gardens, each fruit presenting almost the exact form of a wax taper.

Mr. Prestoe remarked in his Report on these Gardens for 1880, as follows:—

"The highly satisfactory manner in which this tree has thriven "and produced its highly nutritious fruit—together with the fact "that all kinds of stock devour them greedily—induce me to give it "special mention here as a fodder plant specially adapted for tropical "and sub-tropical countries where the annual or occasionally severe "drought occasions a scarcity of fodder for certain periods, such "indeed as occurs, and is a notable drawback to prosperity in some "parts of India, Tropical Australia, Natal, &c."

"I regard the tree as being capable of supplying the tropical dry "season with a source of fodder for stock, just as the temperate "winter has its supply of fodder in Mangles and Swedes, &c."

It is said to have been first distributed to Horticulturists by Mr. Wm. Bull of Chelsea about the year 1863, he having received it from the Isthmus of Panama, and it was shortly afterwards, introduced to these Gardens where it has become fully acclimatized.

138.—ASCLEPIAS CURASSAVICA.—*Linn.*

"Wild Ipecacuanha" "Red Head."

This plant is very common in pastures and waste places in most West Indian Islands. It is commonly used, when pounded, for dressing wounds or sores in which worms or the larvæ of dipterous insects are present, and for this purpose is quite equal to "Capuchin powder" or "Calomel" which are substances also commonly used for this purpose.

For use the Asclepias leaves and flower heads should be pounded in a mortar and after cleaning the wound the mass should be pressed into it and bandaged there for a few hours.

139.—LUCUMA MAMMOSA.—*Gr.*

"Mammee Sapota" "Sapote" or "Sapot."

This tree is quite common in Trinidad, being known locally as the "Sapote" while in Jamaica it is known as the "Mamme Sapota" a name which is here given to the fruit of *Mammea Americana Linn* a curious transposition of local names for the fruit of two distinct plants.

The seed of Lucuma is used commonly in Trinidad for flavouring cakes, but it has been shown by an examination made by Mr. Wm. Kirby in 1889, through the good offices of the Director of the Royal Gardens, Kew, that the seeds contained an appreciable amount of Hydrocyanic acid, and should therefore be used with the greatest caution.

The trees grow to a large size and afford excellent timber. The pulp surrounding the seeds is edible but is not of a character to place it on the list of good table fruits.

140.—CYRTOPODIUM ANDERSONI.—*R. Br.*

This Orchid is a native of Trinidad and grows in open spaces fully exposed to the sun. The fusiform stems are some two to three feet in height—from which the plaited leaves die away after becoming mature. The plant flowers in April and May, from the base of the growing stem, and produces a scape some three feet in height bearing a panicle of brownish yellow flowers. The centre of the basal lobe of the lip is quite yellow with a crenulated and brownish margin. It is

best grown in well drained pots filled with vegetable refuse, dried cow-dung, and broken bricks, and requires plenty of water in the growing season.

141.—"SISAL HEMP."

Our plants of *Agave rigida var. Sisalana* which were procured from Florida some few years ago, have grown so well, and have shewn themselves so well adapted to the climate, that there can no longer be any doubt of the possibility of cultivating them on a large scale in Trinidad, whenever it may become profitable to do so.

We have considerable numbers planted in various districts and the first plants will probably flower during the present year, when the colony will be in possession of centres which can be drawn upon to any extent for extended cultivation.

Sir Ambrose Shea when in the Bahamas ventured the opinion that our climate and soil would be unsuited to the plant, but this has now been most completely disproved, as we have an abundance of plants out of the 10,000 imported which are a real picture of healthy and vigorous growth, and there is reason to believe the fibre they contain is of first class quality.

142.—BOUGAINVILLEA SPECTABILIS.—*Willd.*

This plant is said to be a native of Brazil. A paragraph in the Dictionary of Gardening (Nicholson) reads as follows :—

"B. Spectabilis (showy) *fl.* bracts of a dull brick red, shaded with scarlet, South America, 1829. It is very difficult to obtain bloom on this plant ; and when flowers are produced they are extremely ephemeral. The species is for all practical purposes much inferior to either B. speciosa or B. glabra. Syn. *Josepha Augusta.*"

Mr. Nicholson is of course speaking in the above quotation from the point of view of a cultivator under glass, and from our own experience, we can confirm his notes to the full.

Here however in the open air *Bougainvillea spectabilis* has the opportunity to show its true habit and when once the size of the plant is understood the difficulty of getting it to flower under artificial cultivation is easily estimated. Our oldest plant is now some 90 feet high, with stem 6 to 8 inches in diameter flowering in large masses on the tops of one of our highest trees, and producing huge festoons of blazing red, which are a distinct feature of the Garden and much admired by visitors. It continues in flower for some months during the earlier part of the year.

We find great difficulty in propagating this plant, but after repeated trials, we have succeeded in securing a few plants. One of the difficulties met with, is one which can hardly be appreciated until the cause is known. Cuttings put in under ordinary conditions look well for a time, begin to grow, and suddenly collapse. This result, after many experiments was found to be due to the fact that certain insects fed upon the callus produced at the base of the cutting, and consequently not being able to produce roots, the cutting withered away.

Not only is this the case with the Bougainvillea; but it is especially so with the Rose and other plants. We have succeeded at last—by placing the cuttings inside a water guard—thus excluding insects and we now find that cuttings are raised as easily in our Gardens as elsewhere.

By "water guard" is meant a structure which is completely surrounded by a small canal of water or moat, like the old castles of ancient history. In some places such an arrangement is called an "anti-formica" as it is used as protection for plants against the parasol ant.

143—THE TRANSPORTATION AND VITALITY OF SEEDS.

After many years experience in the harvesting, growing and transporting of West Indian seeds and a similar lengthy experience in growing seeds received here from both Tropical and Temperate climes; it has been found that it is impossible to keep seeds, for any length of time under the climatic conditions which prevail for the greater part of the year in Trinidad. In our dryest season, February, March and April, seeds keep fairly well, but during the wet months they deteriorate rapidly, and soon lose their vitality.

From some correspondents the seeds we receive almost invariably germinate, with others, the opposite is the case.

I am confident that in the latter instance this arises from keeping the seeds in stock too long after ripening and not from any fault of the seeds themselves.

Some seeds, such as those of Cola, Cacao, Castilloa, &c., can only be sent when newly ripened, and packed to germinate during transit—others are more hardy and if sent fresh into a temperate and dry climate will keep longer there (in a temperature of about 60°. Fah. in a dry drawer) than they would in the place where they were grown.

What is stated above is not mere words—It has been proved by experiment that imported seeds rapidly deteriorate week by week when exposed to our atmosphere, and such seeds as lettuce and others will lose all their vitality in a few weeks.

With our own seeds the same has been observed. If we sow as soon as gathered, we get as a rule over 90 per cent. to germinate. If we keep them a month this is reduced by 50 per cent., and the vitality of most seeds is wholly lost if kept for three months before sowing.

At the Gardens therefore we make it a rule, never to keep seeds in stock, but what we require to send away are packed and transmitted by the earliest opportunity after being harvested. When seeds are imported we sow them immediately on arrival, or import them in specially sealed tin parcels which are opened only as required.

The best method of transporting seeds from Europe is in small tin boxes made like a patent biscuit box, (*i.e.*) a box made of light metal, not costing too much in postage, and one readily opened by the thumb piece—the same as a biscuit box, and the boxes should be of small size, and contain small quantities of different seeds in each box, to use for successive sowings.

In packing for sending away—unless sent in a moist state in damp Coco nut fibre--we invariably use canvas bags, as it is useless for us to attempt to seal up in a dry atmosphere; for our climate is much too moist (except perhaps at exceptional times and places) to do this with any hope of success.

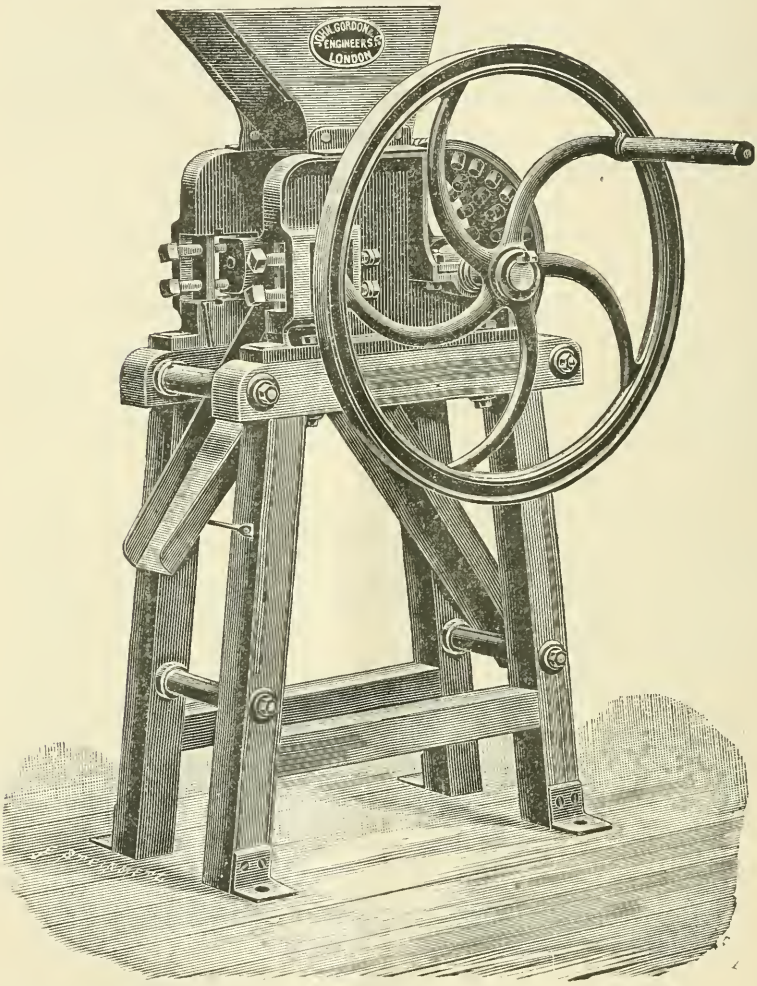
I would urge upon correspondents sending seeds to us from a similar climate as our own, to despatch them as soon as harvested; and not to keep them a single day longer than is necessary, as by so doing they will ensure us a greater measure of success in the germination of them.

144.—NEW COFFEE MACHINES.

In response to representations made to them by those conversant with West Indian requirements Messrs. John Gordon & Co., have prepared a new set of cheap machines which are of a high class, and will prepare Coffee in a very efficient manner.

They are especially suited to the requirements of the Trinidad Planter and can be highly recommended for estates where only small areas are cultivated in Coffee.

Full instructions as to their working can be obtained at the Royal Botanic Gardens where similar machines have been in use for the past few years and the character of the machines can be seen from the illustrations.

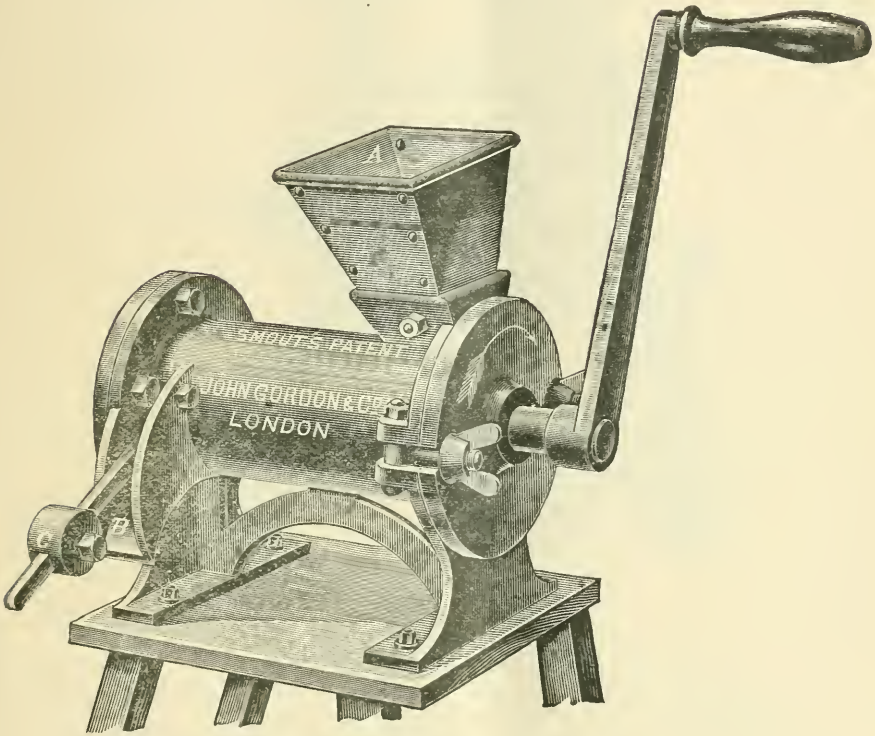


No. A.

THE "JAMAICA" COFFEE PULPER.

Consequent on the demand in the West Indies for a cheap and efficient method of preparing Coffee, Messrs. John Gordon & Co., of London have introduced the No. A. machine.

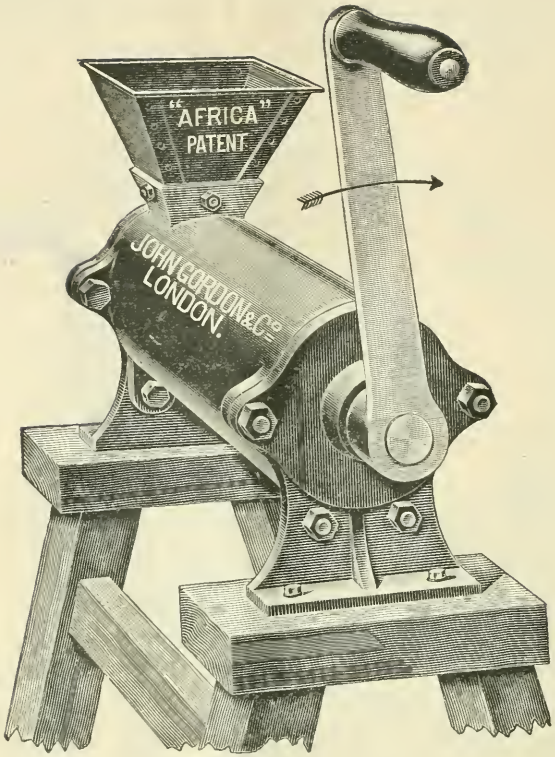
It separates the coffee berry from the surrounding pulp after which the beans can be dried rapidly and a fine quality of coffee produced. Price complete £14,



No. B.

COFFEE PEELER AND POLISHER.

The machine No. B. cleans the Coffee from the parchment skin after it has been pulped by the "Jamaica" or other machines. It is manufactured by Messrs. John Gordon & Co., in various sizes—for machine or hand power. The price of the hand power machine is £8.



No. C.

DRY CHERRY HULLER.

The machine No. C. has been prepared for the use of those planters who prefer to dry the coffee in the "Cherry" and is a cheap and effective machine for the purpose of cleaning it after it has been dried in this way. Price £10. Larger machines are made for w power. This will be e ul for plantations e afficient coffee is grown for ho e use and must displace old pestle and mortar method of cleaning.

TRINIDAD.

ROYAL BOTANIC GARDENS.

BULLETIN

OF

Miscellaneous Information.

No. 4. OCTOBER, 1895. Vol. II.

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Edited by the Superintendent Royal Botanic Gardens,
J. H. HART, F.L.S.

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1895.

145.—DIACRIUM (EPIDENDRUM) BICORNUTUM, Hook. DIACRIUM (EPIDENDRUM) INDIVISUM, Bradf. MSS.

THESE two orchids are still common in Trinidad, although the yearly export by collectors has diminished the supply to a considerable extent.

D. bicornutum is found almost *exclusively on the seashore*, where it grows on rocks and the branches of trees well exposed to the breeze. It forms at times magnificent clumps, which are seen to advantage when in flower, in well protected positions.

A clump of this class was well figured in the *Gardener's Chronicle* for September 22nd, 1884, fig. 45, p. 337. This figure was engraved from a photograph by F. Morin, Esqr., of Port-of-Spain, from a picture of a plant in the garden of a suburban villa belonging to Mrs. Kavanagh.

We have had similar clumps in flower near the office of the Gardens from February to May, where they are simply hung up attached to the blocks of wood as they were cut from seaside trees, having no compost, basket or other support of any kind. The attention they receive is to secure them against the attacks of insects. cockroaches, etc., etc., and to give an occasional watering in dry weather. They are fully exposed vertically, but are sheltered on all sides by buildings and trees.

The second species, *D. indivisum*, Bradf., is one which is confined almost exclusively to the inland districts. It differs from the preceding in being of much smaller size, and by having an undivided lip which is quite white, and not spotted as in *D. bicornutum* and the pseudo bulbs and leaves are also much smaller. An expanded flower of *D. bicornutum*, Hook—which was taken at hazard from a clump—measures $2\frac{1}{4}$ inches in breadth, while another of *D. indivisum*, Bradf., measures only $1\frac{1}{2}$ inches in the same diameter. *D. indivisum* is more amenable to cultivation than its larger brother and makes an exceedingly pretty plant when well grown. Both plants are very impatient of moisture, and when established will stand drought almost with impunity. Doubts have been expressed as to the specific value of the name of *D. indivisum*, Bradf., but to the field Botanist who is conversant with the plants in their homes, the characters are clearly marked, and no intermediate forms have as yet been seen. It is true that the latter plant is (as Grisebach says) nearly allied,

but the difference in form of the lip, its habit, and the colour of the *pseudo* bulbs, as well as its constant habitat in the interior woods would appear to bear out a legitimate claim to specific distinction.

In connection with the growth of orchids it has been noticed that the presence of ants is apparently necessary to their maintaining a healthy condition, but whether this is in reality due to some action of the ant itself, or to some indirect cause, has not yet been proved, and investigations are needed to show what is the real influence the ant has upon the health of the plant. It has been suggested that the presence of stinging ants acts as a protection to the plants, but I am inclined to think from recent investigations that the benefit the ants confer on the plant are those of providing it with the mycelium of a fungus to cover its roots, which organism enables it to take up food which would be otherwise unattainable. It may be shown that the ants act as protectors to the plants, as well as providing them with a means of obtaining nutriment, but it is almost certain that the fungus which grows in the material they accumulate around the roots plays a much more important part, by providing the plant with food material.

146.—EPERUA FALCATA, Aublt.

"Wallaba."

Of this tree there are several specimens in the Gardens. It is a tree common to the Mainland, but so far as I can ascertain it is not indigenous to Trinidad. It is chiefly remarkable for its long pendulous peduncle* and its scimitar-shaped pods. When the latter are ripe the valves separate with a loud noise, and each portion curls up in two or three whorls forming a hollow tube of some six inches in length. The propulsion exerted by the curling up of the valves casts the seed to some distance from the tree. The flowers are very sweet scented and contain a large proportion of nectar, so that they are largely visited by insects, and, as recorded in my Annual Report for 1889, it is also visited by *Glossonycteris Geoffroyi*, Gray, a small bat, with a curiously elongated tongue, especially fitting it for the extraction of the juices secreted by the flowers of this and similar plants. The bats flit about the flowers at night in the same way as the nocturnal *Lepidoptera*, and the animals were at first mistaken for these creatures. Specimens were captured with a muslin net identical in shape with those used by naturalists for the capture of butterflies and other insects.

* Sometimes six feet in length.

The wood of the "Wallaba" is considered very suitable for making "shingles" or wood tiles for the covering of roofs, and is largely used for this purpose on the mainland of South America, especially in British, French and Dutch Guiana, "Wallaba" shingles being a well known article in the markets for housebuilding material.

There is a fairly good figure of the parts of this tree in Aublet's *Plantes de la Guiane*, p. 142, Vol. III., but the Legume is poorly represented.

The tree as it grows under our care is to be compared with Amherstia, and the pods of each being almost identical in shape and hang in the same manner from a long peduncle. The foliage is also very similar in appearance.

147.—BIGNONIA UNGUIS, L.

"Cat's Claw" Creeper.

This plant is one which covers the branches of trees in woodlands and plain, with festoons of green foliage all the year round, and in the flowering season (March and April) it presents such masses of glowing colour to the view as to become quite a feature in the landscape. It is best seen, however, when covering the branches of trees standing singly in pastures or other places where it is restricted in growth. In such positions it surrounds the whole of the trunks and larger branches with its foliage, and flowers are produced from every side forming one solid field of orange yellow bloom, the beauty of which has only to be seen to be highly appreciated, but cannot be accurately described.

The glory of the plant, however, quickly passes away, for the flowers commence to fall on the second or third day, and in a week not a single one is to be seen. In due course these are succeeded by long, pendulous capsules which sometimes reach nearly three feet in length.

Attempts have been made to bring this climber into cultivation, and it was planted on the walls of Government House by one of my predecessors. The plant grows readily, and as a screen for bare walls answers well, but during the past eight years has only produced flowers once, and these poor in size and few in number, and hardly to be recognized as the same produced by its sister plant growing on a tree but a few yards distant; in fact the plant seems unhappy, and

would, if it could speak, probably echo the words of the gipsy girl's lament, who when tired of the routine of civilized or cultivated life sang:

Then take me to my greenwood home,
My heart has long been there,
And nothing but the greenwood now
Can save me from despair.

148.—NATURAL HISTORY NOTES.

No. 13.—Destruction by Bees (*Trigona sp.*)—It has been long a common regret that although flowers are produced in abundance on trees of *Amherstia nobilis* for several months in each year (in 1895 from January to June) it is seldom that good seed is produced.

Mr. Lunt, my assistant, has now pointed out to me the fact that nearly all the nectaries at the base of the calyx tube have been pierced by bees for the purpose of obtaining the nectar, and the damage done is such as to cut off a large portion of the nutriment that should go for the development of the seed. We are aware of many similar instances which are on record, but the observation is here recorded, to point out the possibility of securing seed of rare plants, by carefully protecting the flowers from such attacks, during the period of æstivation and development of the fruiting parts. It is possible that in its native country the insect which has here done damage is not present, and that the plant would seed freely in consequence.

No. 14.—The Hunter Ant of Trinidad.—Our gardens are visited annually, generally during the dry season, by armies of the hunter ant. These armies are numerous and when on the march very destructive to animal life. The columns on the march move as a rule in trains some three or four inches in width, but they spread out in skirmishing formation when the ground to be traversed is likely to contain suitable food. These columns will search a ravine, a stable or a house, and occupy it for hours, destroying every living thing not strong enough to resist their numbers; and even human beings have at times to give way to them. If a dwelling house is entered it is better for the occupants to leave it for a time than to attempt to drive them out. Mice, rats, lizards, snakes, scorpions, centipedes, cockroaches, etc., all kinds of insects and their larvæ, fall a prey to these creatures, and in houses where the *genera Cimex* and *Pulex* are plentiful, the ants make a clean sweep rendering the dwellings absolutely free from the pests for a considerable time, and hence they are welcomed by people

who inhabit houses or dwellings where this class of insects abound. In stables, horses if not removed, are driven almost frantic by them, and cows and other large animals are attacked in the like manner, but unless sickly are too strong to be overcome. Carrion of all kinds is rapidly consumed, the find at once being covered by thousands of insects, and in an incredibly short space of time the whole disappears, and the ants again resume their march. Where plenty of food is to be found the army takes a rest at intervals, and in doing this they accumulate in a sheltered position under a stump, a stone, in a cellar or similar place; here they will rest for hours, and if wet weather intervenes, sometimes for days together. When assembled for rest their appearance is much like a swarm of bees, their legs being apparently adapted for the purpose. The cultivator welcomes the approach of an army of these insects, as there is nothing more destructive among his plants than the *Blatidæ* or cockroaches, many thousands of which are sought out and devoured by an army of hunter ants.

Since our last Bulletin the following have been kindly determined for us by the British Museum authorities :—

No. 15.—*Siphonotus purpureus*, Pocock.—Previously described from St. Vincent. This is a small *Myriapod* or insect belonging to the class to which are referred "centipedes" and "millipedes." It is a very small but interesting insect. It was captured by Mr. Lunt in the Gardens.

No. 16.—*Porphyraspis sp.*—"Tortoise Beetle."—Larvæ only; found upon a Bromeliacous plant. This is a very curious insect indeed, the larvæ looking like a small bunch of lichen and easily mistaken for it.

No. 17.—*Stichoplastis ravidus*, Simon.—This is a large spider which lives on the ground under stones, damp wood, moss, or weeds. It is somewhat like in form the one known as the Tarantula, but neither as large or as hairy as that kind.

No. 18.—*Phalagium cosmetus pictus*, Putz, is another spider of the long-legged or "harvestman" section.

No. 19.—*Planarium sp.* is one of the land leeches which are fairly common in the Garden at times.

No. 20.—"King Cockroach" "Electric Bug," *Belostoma grande* Linn., or *Nepa grandis*, Linn.—This insect though resembling a cockroach at first sight is seen on examination to differ in no little degree, and it is placed by systematists under the family *Nepidæ*, Order *Hemiptera*, an Order which includes the plant bugs—Cicada, etc. The insect according to a paragraph in the *Port-of-Spain Gazette*, a

local newspaper, is known in America as the "Electric Bug," owing to the fact that it is attracted by that light and was not formerly seen in as large numbers as since its introduction. I have seen the insect, however, in the day time, in the city of Panama, Central America, crawling on the streets. Numbers of the insect appeared in Trinidad towards the end of May, 1895. The insect is known also by the name of "Water Scorpion," and is said to feed on fish, and small insects. It is especially fitted for living in water, by a suitable conformation of its body, the underside of which is formed like the keel of a boat, and the legs, especially the posterior ones, are most effective propellers or oars. The insect when the wings are closed measures over four inches in length, and when the wings are expanded their extent is fully seven and a half inches.

No. 21.—The "Gru-Gru" Worm, *Rhyncophorus palmarum*, Linn. —The name of "Gru-Gru Worm" is given in Trinidad to the larvæ of the large Palm Beetle, *Rhyncophorus palmarum*, Linn., which is found in many species of the indigenous Palmæ. The full grown worm is considered a very fine dish for the table, when properly cooked, and is readily sold in the markets of Port-of-Spain, to members of both the higher and lower classes of society. The worm takes its name from the fact of its being found in the "Gru-Gru" Palm, *Acrocomia sclerocarpa*, Mart., but it is not alone common to this palm, for it infests many others, and especially *Oreodoxa regia*, Kth., the Cabbage Palm. All that it is necessary to produce quantities of the "Gru-Gru" worm is, to wound the stem or trunk sufficiently to reach to the interior cellular mass, when mature beetles will, with the greatest certainty, be attracted thereto for the purpose of laying their eggs, and the worms will then be produced in large numbers. Although the beetle is present with us in considerable numbers and is capable of entering and destroying large palm trees, it is curious to note how very few trees are actually destroyed by it, either when growing naturally or cultivated, and it appears that in the majority of cases, it is the infliction of a superficial wound which allows of the entrance of the beetle. This shows how careful the cultivator should be with his coconut and other palms, not to allow any hacking or cutting of the stems of his trees, where the insect is known to be plentiful. Although it is known to be quite common in Trinidad, and the worms or larvæ produced in wounded trees, yet it is but rarely that the insects are seen. But let a palm be cut down or wounded and the wound will, in a few hours, be frequently visited by the mature beetles of both sexes.

These facts I believe tend to point out that the insect must have other sources of food supply besides the various palms which it attacks, and that palms will not suffer severely in places where such a food supply is fairly constant. Practically it cannot be said that our Palms in the Royal Botanic Gardens suffer from the attack of the *Rhyncophorus*, yet at the same time we know positively that it is certain destruction to any palm to wound its stem in such a manner as will allow the beetle access thereto; and a palm cut down and left to decay upon the ground, provides nutriment for large numbers of the larvæ in the cellular matter of its interior, where they will feed, pass through the *pupa* stage, and finally leave as perfect insects. To prevent the access of the beetle to wounds when accidentally made, there is nothing better than a coating of coal tar mixed with clay to the consistency of paste, applied before an opportunity is afforded for a visit from the beetle.

No. 22.—An Addition to the Trinidad List of Coccidæ or Scale Insects.—No. 30 of our Trinidad list has been named *Datylopius sacchari*, Ckll., *n. sp.* This was found in large numbers feeding upon sugar cane plants in our Gardens. It was also found by Mr. Urich and sent to Professor Cockerell a few days previous to my consignment reaching him. The insect itself is what is commonly known as a "mealy bug"—a class of insects somewhat common in the tropics, and where found in large numbers, a great hindrance to good cultivation. No. 31 of our list is another "scale insect" found on roots of *Dioscorea* or "Yam," on which it was very plentiful. Professor Cockerell has noted its habitat as a somewhat remarkable one, as will be seen in his description which is here published. Neither of the insects at present give serious trouble to cultivators.

A new Scale Insect infesting Yam Roots. By T. D. A. Cockerell, Entomologist of the New Mexico (U.S.A.) Agricultural Experiment Station.

Aspidiotus Hartii, new species.—Female scales irregular, subcircular to oval, about 1½ mm. diameter, moderately convex, dull brownish-grey, with a slight purplish tint; first skin partly covered or entirely exposed, shining pale straw colour, nearly central. Removed from the plant the scales leave a conspicuous white mark, without any black ring. Male scales coloured like those of the female, small, elongate, with the exuviæ near one end.

Female brown, becoming pale lemon yellow when boiled in caustic soda. Five groups of ventral glands, caudolaterals of 6 to 7, cephalolaterals of 9, median of about 4. Anal orifice posterior to level of caudolateral groups, but some distance from hind end. No long tubular glands at bases of lobes. Two pairs of lobes only; median large with parallel sides and gently rounded subtruncate ends, slightly diverging, not contiguous, obscurely notched at end towards outer side. Second lobes similar in shape, but much smaller. Two rather stout branched plates between median lobes and two between first and second lobes; margin cephalad of second lobe with first three stout strongly branched plates close together, then three equally long but not so stout and only slightly branched plates further apart. Then two very slender small plates, then a long interval, then the margin coarsely serrate, with about six serrations.

Hab., Trinidad, in great numbers on yam roots; sent by Mr. J. H. Hart. Allied to *A. sacchari*, Ckll., In. Inst., Jamaica, Vol. I., p. 255. The habitat of these scales, on yam roots, is remarkable; a similar instance is offered by a new *Lecanium* (*L. batatæ*, Ckll., n. sp.) found by Mr. Barber in Antigua, on tubers of sweet potato.

Las Cruces, New Mexico, U.S.A.,
June 10, 1895.

149.—A NEW FUNGUS.*

A new species of Entophyte, Cordyceps Lunti, n. sp. (Fungus), a parasite on the larvæ of an Elateridæ. By A. Giard. (See Circular Note 21.)

Mr. J. H. Hart, Superintendent of Agriculture in Trinidad, has recently sent me a superb Entophyte found by his assistant, Mr. W. Lunt, in the Botanic Garden of the Island.

It is a Cordyceps, parasitic upon the larvæ of an Elaterideæ of large size (45 mill. long), belonging, I think, to the group of the Agrypnini.

The whole of the body of the larva is covered by a downy felting formed by the conidial state of the Fungus.

The ascigerous receptacles spring from the ventral surface, the one near the middle of the body, the other near the posterior quarter of the larva.

The first is nearly 5 cent. long, the second about 3 cent. 5. Their form is that of a club regularly thickened and conical at the end.

The peduncular portion is 2 cent. long and 1 mill. 5 wide, the thickest part has a width of 2 mill. 5. The clubs of both receptacles approach each other and have coalesced for a length of 4 or 5 mill. The perithecia are irregularly distributed, more abundant on one side than on the other and leaving at the top a small sterile space which elsewhere is not so distinctly separated from the rest of the club.

The whole of the Fungus, the portion underground and the head *(capitules)* is of a beautiful orange red; the perithecia only forming fine brownish punctuations on the receptacular clubs.

Cordyceps Lunti comes near, by its colour and general aspect, *Cordyceps calocerοides*, Berk & Curt, found in Cuba on an undetermined substratum, and very imperfectly described.

* Translation from the *Bulletin des Séances et Bulletin Bibliographique de la Société Entomologique de France.*

But in the unique example of the latter, the receptacle was much longer (11 cent., comprising the peduncle, which measured about 6 cent.)

Further, this receptacle was bifurcated. The clubs having a more or less cylindrical form, without enlargement in the middle.

Cooke compares them to a darning needle. There are known already, on the larvæ of the Elateridæ, two Cordyceps—*C. stylophora*, Berk & Br., from South Carolina, and an unnamed species found by Mr. Mac-Owan at the Cape of Good Hope; but these two species are of small size and are near to *C. Barnesii*, Thw., parasites on the larvæ of Melonthideæ of Ceylon.

150.–CASSAVA OR MANIOC.

Mahihot Aipi.

In a paper read before the Agricultural Society of Trinidad in May, 1895, Mr. T. J. St. Hill answers the question "Does Sweet Cassava ever come bitter and poisonous?" with the words "*emphatically it does*," and proceeds to mention several varieties by name. He says those with "white and black stems are very apt to degenerate into the bitter," and states that the change *seems to depend upon the soil, as well as the length of time the roots are allowed to "stand over,"* and that the roots will not become sweet again after once becoming bitter. (Italics ours).

Mr. St. Hill states that native growers distinguish six varieties, known respectively as—

1.	Manioc Fromageux.	4.	Manioc Frère Boy.
2.	,, Cochon.	5.	,, Camanioc.
3.	,, Frère Pierre.	6.	,, Augure.

The last he states to be the most poisonous, and from his personal observations he makes three distinct kinds of bitter Cassava.

The question of poison in Cassava or Manioc was referred to in Bulletin No. 1, Vol. II., January, 1895, Article 101. It was there stated as follows :--

> It becomes fairly clear that, either we have not the true non-poisonous variety in Trinidad or that Francis did not find it; or 2nd, that there is over confidence in attributing non-poisonous properties to the sweet Cassava.

Mr. St. Hill's paper goes to confirm the supposition above given; and until it is proved by analysis of sets of specimens from different districts, that there exists a kind of sweet Cassava which does not contain any poisonous principle whatever, it would be safer to take Mr. St. Hill's statement as correct.

If a kind exists which really contains no poison, it is quite time such a fact should be more fully confirmed, as it would probably be much more largely cultivated: but if on the other hand we are cultivating a spurious sweet Cassava which at any time may prove to be of a poisonous character, changing, as Mr. St. Hill says it does, from sweet to bitter, from innocuous to poisonous, it is also quite true that this dangerous fact should be fully known, and the cultivator warned of the changeable character of his produce.

It is well known that in many West Indian Islands there exists kinds of sweet Cassava which are taken to be perfectly harmless, and said to be free from poison. Is this really the case, and can it be proved that it never degenerates or changes into one of a poisonous character in the manner Mr. St. Hill asserts our sweet variety changes from sweet to bitter?

151.—NEW MINIATURE SUNFLOWER.

HELIANTHUS SP.

UNDER the above name we have had plants which have supplied us during April and May with a perfect blaze of yellow blossoms in our flower garden beds. The seed was procured from Messrs. Veitch & Sons, the long established and well known firm of the King's Road Chelsea, London. The plant is much to be preferred in every respect to the ordinary sunflower, *Helianthus annuus*, and is one especially suited for a tropical flower garden during the dry season of the year.

152.—CIRCULAR NOTES.

These are issued from time to time as found necessary, and are republished here to maintain a permanent record of the subjects treated upon. The date of issue is given to each.

CIRCULAR NOTE No. 22.

A Cane Pest.

IN carrying on the cultivation of an experimental plot of canes at the Royal Botanic Gardens, cuttings or "tops" of several new varieties were planted. These were attacked very shortly afterwards and large burrows eaten into them, by the "white" or "wood ant," belonging to the *Termitidæ*. Following the attack upon the cuttings, the insects fell upon the base of well-grown canes, eight to ten feet long, and cut into them at the surface of the ground in such a manner as to cause

the cane to fall. An examination showed that the part destroyed was not more than one foot in length, from the ground upwards, and that the tunnels bored were in possession of a parasitic fungus, *Trichosphœria sacchari*, the surrounding tissue being blackened by the chain-like macrospores of that organism, and the ants appeared to have confined their depredations principally to this section. From the blackened part, the fungus could be clearly traced by the discolouration, which passing from black into deep red, then became gradually lighter until it finally disappeared in healthy tissue, at some two feet from the ground line.

The attack on the plot has not been general, and seldom more than one or two canes in a stool have suffered; but it is considered desirable to put the occurrence on record for future reference.

Whether the attack is to be attributed to the nearness of woodland country—the natural breeding ground of the insect—or to a possible scarcity of suitable food, or whether the attack has simply been made on canes attacked by *Trichosphœria* has yet to be determined; but it may be stated that there is evidence which points to the latter conclusion, but further observations are yet needed to confirm this view.

There is also evidence that wood in buildings, or that in trees, which has in any way lost its vitality, is first attacked by the mycelium of a fungus which renders it a tempting food for the "wood ant," a circumstance which would tend to explain the destruction of timber which takes place in a damp atmosphere; for it is clearly certain that microscopic fungi are more quickly developed in such places, than in a dry atmosphere.

J. H. Hart.

May 14th, 1895.

Circular Note No. 23.

A Flight of "Parasol Ants."

On 25th May I had occasion to attend the Port-of-Spain Railway Station, and proceeding thitherwards in the early morning I found the road all along the route, from the Gardens to the Station, covered by myriads of the winged form of the Parasol Ant known as *Atta Octospinosa, Reich.*; which is so common in the neighbourhood of the Town of Port-of-Spain to the exclusion of its larger brother, *Atta cephalotes*, or the woodland "Parasol Ant" the "Sauba" of Nicaragua. Opportunity is taken of this occurrence to point out the lesson it

teaches, which is, THAT THE NEST OF THE "PARASOL ANT" SHOULD ALWAYS BE DESTROYED PREVIOUS TO THE TIME OF THE ANNUAL FLIGHT, which occurs generally in May or June.

During this annual flight it is certain that marital relations between the sexes are established, and the various Queens which survive are certain to become the founders of new nests in the most suitable situations in which they happen to find themselves.

If however the parent nests are destroyed regularly during the early months of the year, before the winged or perfect forms are produced, the attempt to reduce their numbers in the Colony as a whole has a better chance of succeeding.

J. H. HART.

6th June, 1895.

CIRCULAR NOTE No. 24.

"Cockchafer" "May-Bug" or "Beetle," *Melolontha sp.*

ON a visit to the Montserrat district on June 9th I found an insect in large numbers destroying the foliage of several kinds of trees.

Among these was noted *Spondias dulcis* or *Pomme Cythere, Cicca disticha* or the *Jimbilin, Theobroma Cacao* or *Cacao*, and others.

The trees attacked were totally stripped of their leaves, and it was evident that serious harm had been suffered.

The insect is evidently a very near relation of the English beetle, *Melolantha vulgaris*, for it has the same habits, but it requires time to ascertain whether it passes its various stages in the same period of time, and its exact scientific determination. It is however much smaller in size. If, like the English species, it lives but a few days in its mature stage, there is little danger to be apprehended, unless owing to some abnormal increase of its numbers caused by the absence of natural enemies.

At the present time, though present in some thousands and capable of destroying the foliage of trees in a few hours, the presence of the beetle is not so general as to cause the cacao planter serious apprehension.

Nevertheless a careful watch should be kept to ascertain whether the numbers increase from year to year.

As the beetles can be collected at little cost by simply shaking them from the trees during the day time, it will be seen to be advisable in any case to destroy as many as possible, so as to prevent their increase in such a degree as would make their presence an annual scourge.

The habits of the English species are well given in "The Treasury of Natural History" which can be seen at the Public Library.

J. H. Hart.

12th June, 1895.

Circular Note No. 25.

The Larger Species of "Parasol Ant," *Atta (Œcodoma) Cephalotes.*

In my annual report for the year 1890 I mentioned that specimens of a large winged ant had been sent to me as "Queen" Parasol Ants. Nothing being conclusively known as to their origin, the specimens were provisionally determined as *Atta fervens*, Say. After a specimen had been found on the Savannah on the 25th instant, I caused a search to be made in two large nests of *Atta cephalotes* when numbers of the large winged forms were found to be present, which clearly identifies them as mature forms of that species.

The insects with wings expanded, measure $2\frac{1}{4}$ inches, and when the wings are closed the length of the insect is about $1\frac{1}{2}$ inches. This species is not to be confused with that mentioned in No. 23 as that is a much smaller species, and is named *Atta Octospinosa, Reich.* The species we now refer to might well be called the ant of the woods, as it founds its colonies principally in forest lands, and may readily be distinguished from its smaller brother by the domes of leaves which it accumulates at the entrance of its nest, which gives rise to its scientific name. It having become apparent that a flight of mature insects is now taking place, planters should note how important it is that these winged forms should be destroyed, as it is certain that such destruction regularly carried out would materially affect the number of nests which will appear.

The forms seen in the nests were as follows: -No. 1, Queen; No. 2, Males; No. 3, Soldiers; No. 4, Large Workers; No. 5, Smaller Workers; and No 6, the Nurses or the smallest form. The first and second forms only are winged.

Lubbock in "Ants Bees and Wasps" appears to give only Nos. 3 and 5, although he quotes Bates's statement that there are five forms.

J. H. Hart.

26th June, 1895.

153.—LAGERSTRŒMIA FLOS-REGINÆ.

Our largest tree of this magnificent species is growing on the lawn immediately opposite the front entrance to the residence of His

Excellency the Governor, which is located almost in the centre of the Royal Botanic Gardens.

From measurements recently taken, it has been ascertained that this tree is 63 feet in height, the spread of its branches is nearly 70 feet, and the circumference of the stem at 3 feet above the ground is 12 feet. The tree is evidently very old, but is still in vigorous health, and flowers regularly every year during June and July, the bloom lasting for about six weeks. Many trials have been made in Trinidad to raise seedlings from this and other trees of the same species, but so far without success. Yet, seed sent from the East Indies and also from the neighbouring island of Grenada produces plants freely. This is a curious fact, but one which is deserving of full enquiry, as it belongs to that class of problems which, once solved, lead the way to further knowledge. It may arise from causes referred to under No. 148.

154.—LOCAL PLANT NAMES.

A LOCAL newspaper writer quoting from Butler's "Hudibras" refers to plant names in the following terms :—

> A Babylonish dialect
> Which learned pedants much effect.
> It was a parti-coloured dress.
> Of patched and piebald languages ;
> 'Twas English cut on Greek and Latin,
> Like fustian heretofore on satin.

The writer goes on to say :—"It is no doubt necessary to use a "language of this kind for the purposes of classification, but we think "that the interest in plants would be considerably increased if "wherever possible the familiar names were printed alongside of their "resonant and rather alarming botanical titles."

To such writers we say, as we have said many times before, that the request is a very common, and to the uninitiated, apparently a very reasonable one, but it is nevertheless one which it is impossible to comply with in the majority of instances. It is proper, however, that the reasons should be given why, what are called *familiar* names, should not be adopted in answer to the writer above mentioned.

If Linnæus the great Swedish botanist over a hundred years ago adopted bi-nominal terms for plants because he found others were insufficient and inaccurate, and because such a class of names could *not be found in sufficient numbers* for the plants then known ; how much more must such nomenclature be needed at the present day, when the number of plants has increased more than a hundredfold above Linnœus' register ? The answer cannot be doubtful. But I

fancy I hear some of our friends saying, "but you might use the common and familiar names when known." Just so. So we would if there was the least propriety or practical use in our so doing, but as there is not, we adhere to the system which is laid down as the more accurate and useful, and let others do as they please.

No one, not even the "dry-as-dust" systematic botanist, is above the sentiment and feeling for the old familiar names of childhood, nor do they put aside as unpleasant, the reminiscences they recall to the mind, but in practice, such sentiments and memories, have to be subordinate to considerations which induce the use of terms that more accurately define the object which it is intended to indicate, and the use of popular or *familiar* names is left to the poet, the lover or the amateur plant cultivator, and others skilled in what is called the "Language of Flowers" and these should really not insist on the practical man devoting his time to the study of names which he well knows lead to nothing but error and confusion.

Even in the subject of the *Forget-me-not*, there is frequently dispute as to the plant in the legend which received the name *Forget-me-not*; and when it is stated that there are several species of *Myosotis* to which it may be applied, each distinct from the other, and that the name may be, and sometimes is, also applied to other *genera* than Myosotis, the legendary name is seen at once to rest on an insecure foundation.

It is the same with all common or local names. They are applied in different places to totally different things, and out of certain limits quite incapable of general use.

The "May-flower" of England is the blossom of the "White-thorn" of the hedges. The "May-flower" of America is a low growing plant creeping upon the ground and hidden under the snow, both perfectly distinct one from the other, and therefore more accurate names than "May-flower" have to be used to accurately denote them.

The word "Gommier" is used in Trinidad to denote *Bursera gummifera*, a tree producing gum. In Grenada the same word is applied to a tree known as *Dacryodes hexandra*, and similar examples could be multiplied indefinitely.

If, however, persons unskilled in botanical nomenclature choose to use *sentimental*, *local*, *familiar*, or *common* names, by all means let them do so, and enjoy the use of them to the full! But they should really stop there, and not press the use of such names on those who have better and more accurate ones at their disposal, notwithstanding the fact that they are made up of *English cut on Greek*

and Latin. Admitting that botanical names are composed of a Babylonish dialect, the Hanging Gardens of Babylon were noted for their richness and the number of p'ants they contained, and why a *Babylonish dialect* should be objected to for the naming Garden plants is hard to conceive, if by its use plants can be accurately identified.

The binominal system of nomenclature is a *universal one*, and a plant named under it, is capable of being understood in civilized countries anywhere under the canopy of heaven, no matter the nature of the language spoken by its people.

To those whose path of life compels acquaintance with accurate plant nomenclature the demand for the use of popular or "familiar" names is a cry—not new—but one which has to be met with an unflinching front, for it is certain that definite and accurate names or terms are in the main far better for daily use, than those which simply convey a sentiment, or awaken a memory, without informing the understanding of any definite character of the plant spoken of, or without giving any clue to its history.

> What's in a name? That which we call Rose
> By any other name would smell as sweet.

Lovers of familiar names can certainly use them at their pleasure, and no one would object, but it is not easy to see why Botanists should be called upon to use names in which they do not believe; and which are indefinite and misleading, while they have at their command, names which are accurate, and universally applied.

154.—THE CONSTITUENTS OF "PIPER OVATUM," Vahl.

The full text of the paper written on the results of the examination made by Profs. Dunstan and Garnett on the above plant is here given, as being of special interest to the Colony in which the plant grows from which the new drug has been made. In article No. 106, No. 2, Vol. 2, p. 35, the history of the plant is given at some length.

By Wyndham R. Dunstan, M.A., F.R.S., and Henry Garnett.

This plant *(Piper ovatum* Vahl, or *Ottonia Vahlii)* grows in the West Indies, and is briefly described in Grisebach's "Flora of the West Indies," (p. 172.) It has been examined in this laboratory, at the suggestion of Mr. W. T. Thistlton Dyer, F.R.S., the Director of the Royal Gardens, Kew, who received it from Mr. John H. Hart, F.L.S., the Superintendent of the Royal Botanic Garden, at Trinidad, to whom we are indebted for a further supply of the material. The plant somewhat resembles Jaborandi in appearance, and has been employed in Trinidad as a remedy for snake bite, and as a cure for hydrophobia in animals. When chewed, it gives rise to a persistent tingling of the tongue and lips, which is followed by a sensation of numbness, accompanied by profuse salivation, in these respects recalling pellitory. Some irritation at the

back of the throat is also observed. All part of the plant—leaves, stem, and root—possess this property, but the leaves and root appear to act more powerfully than the stem; the leaves have an aromatic taste due to an essential oil which is absent from the root.

The following is a brief botanical description of *Piper ovatum*, taken partly from Grisebach and partly from our own observations.

Shrub, 2—4 feet high; root woody, spreading. Stems erect, slender, somewhat woody, branching in zig-zags, nodes tumid; leaves alternate, 3—6 inches long, 2—3 inches broad, ovate, pointed, broadly cuneate at base, papery opaque, glabrous; petiole channelled, naked, about $\frac{1}{8}$—$\frac{1}{4}$ inch long. Flowers usually racemose, pedicles jointed with the flower. Bracts cucullate, usually at the base of a pedicel; stamens 4(—3) inserted round the ovary; stigmas 4, sessile. Pericarp baccate, tetragonal. Berries pedicellate, somewhat longer than their pedicel, rounded at base, mucronate with a bluntish point. Habitat, Trinidad.

A number of the living plants have been brought to England, in Wardian cases, and are at present growing at Kew Gardens, but so far they have shown no signs of flowering.

Volatile Constituents.

As the aromatic taste of the leaves suggested the probability of the presence of a volatile oil, the leaves were distilled with steam in the usual manner and the distillate extracted with ether. By this means a small quantity of an almost colourless, volatile, aromatic oil was obtained which was non-alkaloïdal and did not produce any tingling of the tongue. When cooled below 0° and stirred, the oil showed no tendency to solidify. Its density was $15°/15° = 0{\cdot}9904$. It boiled at about 245°, nearly the whole passing over between 240° and 250°. It appears to be optically inactive, since a 6 per cent. solution in alcohol produced no rotation of the polarised ray. When dry hydrogen chloride was led into a dry ethereal solution of the oil, there was no separation of crystals, even after the liquid had been cooled to —13°. When a drop of the oil was dissolved in chloroform and strong sulphuric acid added, an inteuse crimson coloration was produced, passing into a reddish-violet. Aqueous alkalis did not act on the oil, and it formed no compound with sodium hydrogen sulphite. We have not had sufficient of the substance for analysis, but from the properties recorded above the volatile oil of *Piper ovatum* would appear to be a *sesquiterpene*. The leaves contain this oil to the largest extent, little or none being present in the root or stem.

Non-volatile Constituents.

The liquid remaining with the leaves after distilling off the oil with steam, though highly coloured, had none of the activity of the leaves themselves, and gave rise to little or no tingling when tasted; it was, therefore, clear that the active constituent was not appreciably soluble in water. This aqueous solution contained no alkaloïd, but a *sugar* having cupric reducing power was present, and also a considerable quantity of *potassium nitrate*. The leaves having been drained from the water were digested for some hours with boiling alcohol (50 per cent.), the process being repeated until they had lost nearly all their tingling property. The green alcoholic solution, which was highly active, was evaporated to dryness, the residue extracted with absolute alcohol, and the alcoholic solution fractionally precipitated by the addition of small quantities of water aided by the evaporation of some of the alcohol. The first precipitate contained nearly the whole of the chlorophyll, but scarcely any of the active constituent. The second precipitate also contained chlorophyll, but was active although not nearly so strongly as the filtrate; this second precipitate was, therefore, dissolved in alcohol and reprecipitated by water, the filtrate being added to the original filtrate, and the whole evaporated until the alcohol had been dissipated. The aqueous solution was then extracted by shaking with ether which removed the active constituent together with colouring matter. The residue left on evaporating the ether was dissolved in alcohol, and the solution fractionally precipitated with water, this process being repeated until the whole of the green colouring matter had been removed. Ether then extracted from the liquid, after the evaporation of the alcohol, a light brown resin which was highly active in inducing tingling of the tongue and showed no signs of crystallisation even after prolonged standing.

The similarity in the physiological action of *Piper ovatum* to that of the medicinal pellitory has already been noticed, and in the latter case the action is usually attributed to a resin, about the properties of which, however, little is known.* The resin obtained from *Piper ovatum* was fully examined in the hope of separating some crystalline active substance from it. It was soon found that the resin was not a single substance, in spite of the long process of purification to which it had already been submitted. It was further purified by dissolving it in ether, and fractionally precipitating the ethereal solution with light petroleum, in which the active constituent is nearly insoluble; by this means, it was obtained lighter in colour but still resinous. The resin was again dissolved in ether, and the solution shaken with weak aqueous ammonia, which removed a further quantity of inactive material. After the ethereal solution had been dried with calcium chloride, a resin, which was quite inactive, separated from the liquid.

The ethereal solution, when spontaneously evaporated, left a highly active substance which, however, was still resinous, and refused to crystallise. The resin was next dissolved in alcohol, and the solution fractionally precipitated by the addition of water; the first fraction was resinous and nearly inactive, the later fractions were lighter in colour than the first and highly active. On repeating the process on the later fraction, a bulky but very light mass of feathery crystals separated, which were nearly colourless and more active than any substance previously obtained. This material was, with difficulty, recrystallised several times from dilute alcohol, and lastly from hot, light petroleum. A further quantity was obtained from the purified resin by shaking the ethereal solution with ammonia, dissolving the residue in alcohol, and precipitating the solution with light petroleum, the precipitate being again dissolved in alcohol and reprecipitated with petroleum until it was capable of crystallising.

As will be inferred from the details which have been given, the separation of this crystalline active substance from the colouring matter, fat, wax, and resin which so obstinately adhere to it proved to be a very tedious operation, especially troublesome when the object was to obtain a sufficient quantity for analysis. Much time was spent in trying various methods of extracting the substance from the plant, and in purifying the product; the most successful plan was found to be the following, which, however, is still long and laborious.

The dried and finely-powdered material (leaves, root, and stem, all of which contain the active constituent) is repeatedly extracted with hot, light petroleum (boiling below 80°) until the active substance is almost entirely removed; the removal of the last traces is very troublesome. The active constituent is not readily soluble in light petroleum, but it is found to be advantageous to use this liquid because it removes a smaller quantity of other substances than is the case with better solvents of the active constituent, such as alcohol, ether, chloroform, or acetone, which dissolve so much colouring matter, resin, and fat that the subsequent purification of the active substance is very much lengthened.

The greater part of the light petroleum is distilled from the solution, and the residue is well shaken with alcohol (60 per cent.). By repeating this operation several times, nearly the whole of the active constituent passes into the alcohol, whilst most of the colouring matter, fat, essential oil, &c., remains in the layer of petroleum. On concentrating the dilute alcoholic solution, a considerable quantity of semi-crystalline active substance separates along with green colouring matter; this is partially purified by repeated crystallisation from dilute alcohol. By this means much of the resin, which so obstinately clings to it, is removed, and more is separated by shaking an ethereal solution with dilute aqueous ammonia. The dried ethereal solution may then be precipitated by the addition of small quantities of light petroleum, which throws out the resin in the first fraction, whilst the later fractions are crystalline and consist of the nearly pure active constituent. Finally, the substance is recrystallised by adding dry ether to its solution in absolute alcohol, and allowing the solution to evaporate spontaneously. The crystals which separate are dried on a tile in the air or in a desiccator; at 100° a little decomposition occurs, and the crystals become slightly yellow.

The preparation of sufficient material for analysis occupied a very long time, since the best process for isolating it is rather wasteful, as some of the active constituent is thrown down along with the resin during the fractional

* See the following paper.

precipitation, and requires a succession of similar operations in order to recover it. Although we have used about 12 kilos. of the plant, we were not able to prepare more than about 2 grams of the pure active constituent. In all probability the plant does not contain as much as 0·1 per cent. of this substance, but exerts so powerful a physiological action that from the effect produced by chewing the leaves or root one is led to expect a far larger proportion.

Properties and Composition of the Active Constituent, Piperovatine.

When pure, the active constituent forms colourless, light needless which often crystallise in rosettes. In appearance, these somewhat resemble the alkaloïd caffeïne, and melt at 123° (corr.), decomposing slightly. The substance is nearly insoluble in water, very sparingly soluble in light petroleum, and not much more so in dry ether. It dissolves readily in alcohol, chloroform, and acetone. The solution of the highly purified substance in strong alcohol has the curious property of apparently gelatinising when water is added to it in just sufficient quantity to cause precipitation; the dissolved substance being thrown out in a bulky mass of microscopic crystals resembling a jelly. On this account it is difficult to obtain it in well-defined crystals, but this may be managed by adding dry ether to the solution in absolute alcohol, and allowing the liquid to evaporate spontaneously. The substance appears to be optically inactive; an alcoholic solution containing. 1·5 per cent. did not rotate the polarised ray. The compound contains carbon, hydrogen, nitrogen, and oxygen. Several combustions have been made with different specimens of the material, with the following results.

I.	0·1054 gave	0.2813 CO_2	and	0·0858 H_2O.	C = 72·78; H = 9·04.
II.	0·2023 ,,	0·5335 ,,	,,	0·1484 ,,	C = 71·92; H = 8.15.
III.	0·1847 ,,	0·4982 ,,	,,	0.1391 ,,	C = 73·56; H = 8·37.
IV.	0·1775 ,,	0·4810 ,,	,,	0·1356 ,,	C = 73·90; H = 8·49.

Of these four combustions, III and IV were made with the purest specimens, and give as a mean composition C = 73·73, H = 8·43 per cent., the percentage of nitrogen (determined by the absolute method) was 5·96. These data agree well with those calculated from the formula $C_{16}H_{21}NO_2$, which requires C = 74·13; H = 8·10; N = 5·40 per cent. The active constituent exhibits, therefore, the composition of a vegetable alkaloïd, and shows some resemblance to piperine ($C_{17}H_{19}NO_3$), the alkaloïd of pepper, a plant belonging to the same natural order.

Piperine has very feebly basic properties, and forms salts which are very unstable. The substance from *Piper oratum*, to which we propose to assign the name *piperovatine*, is devoid of basic properties, being nearly insoluble in dilute acids, and therefore, from this point of view, does not come within the usual definition of an alkaloïd. Nevertheless, further investigation will probably show that its constitution is precisely similar to that of such alkaloïds as piperine, atropine, and aconitine, that is to say, it would seem from our observations to be composed of a basic pyridine nucleus (*e.g.*, piperidine), associated with an acid radicle, the acidity of the radicle exactly neutralising the basic power of the other residue, so that the resulting derivative is neither basic nor acidic.

Piperovatine dissolves in glacial acetic acid, but may be precipitated unchanged by the addition of water. It is insoluble in dilute hydrochloric acid and in dilute sulphuric acid; on boiling it with these acids, hydrolysis appears to take place, and the solution now gives the reactions of an alkaloïd, but we have not obtained sufficient of the product for identification. It appears, however, to be a pyridine derivative, and to present some analogies to piperidine; there would seem to be also an acid product of hydrolysis, but this we have never obtained except in traces.

Piperovatine is also devoid of acid properties. It does not dissolve in weak alkalis. Strong alkalis such as potash, especially when warm, appear to hydrolyse it, quickly forming the acid and the pyridine base referred to above.

Its decomposition products require a fuller examination than we have been able to subject them to with the small quantity of material at our disposal.

Physiological Action of Piperovatine.

The physiological action of piperovatine has been investigated for us by Professor Cash, F.R.S., of Aberdeen. He finds it to act as a temporary depressant of both motor and sensory nerve fibres, and also of sensory nerve terminations,

producing some local anæsthesia. It acts as a heart poison, and also as a powerful stimulant to the spinal cord (in frogs), causing a tonic spasm somewhat resembling that produced by strychnine.

A 2·5 per cent. solution (in almond oil) produced no anæsthetic effect when rubbed on the skin, and it has been found generally to possess but little penetrative power, at all events in the form of this solution. When, however, the same solution is applied to the tongue, moderate local anæsthesia is produced, accompanied by a feeling of numbness and coldness, and much salivation.

In attempting to utilise the local anæsthetic effect of piperovatine, the want of penetrating power, the temporary character of its action, and, above all, its property of causing salivation, have interfered with its successful employment in the minor operations of dentistry. The solution of piperovatine in almond oil has, however, given promising results in affording temporary relief in painful superficial lesions.

It would therefore seem to be worth while to follow up in therapeutic trials the analogies, suggested by these preliminary experiments, of the physiological action of piperovatine to that of strychnine, cocaïne, pilocarpine, and piperine. It is also clear that the action of piperovatine is very similar to that of the medicinal pellitory, the *Anacyclus Pyrethrum* of the Pharmacopœia, and it might be useful to determine how far this similarity can be traced, and also whether *Piper ovatum* or its alkaloïd piperovatine could be used medicinally in the place of pellitory.

Research Laboratory,
Pharmaceutical Society, London.

Imperial Institute Road,
London, S.W.,
25th July, 1895.

Sir,

I have to acknowledge the receipt of your letter dated 10th July, and of a sample of Sisal fibre.

I have sent some of the fibre to our Expert for Fibres, and shall have much pleasure in communicating to you his opinion, when obtained, together with the results of its chemical examination in the Research Laboratory of the Imperial Institute.

I am,

Yours faithfully,

F. A. ABEL,
Secretary & Director.

J. H. Hart, Esq., F.L.S.,
Director of the Royal Botanic Gardens,
Trinidad.

Imperial Institute Road,
London, S.W.,
7th August, 1895.

Sir,

The sample of fibre prepared from the leaves of *Agave rigida var. sisalana*, to which your letter of the 10th July refers, has been submitted to thorough chemical examination in the Research Department, according to the method adopted for determining the value of fibres, and I send you herewith the

numerical results arrived at (mean of two examinations) in comparison with the results furnished by a sample of Bahamas Sisal. These numbers indicate that the sample of fibre sent by *you is distinctly superior to the Bahamas sample.*

The Trinidad fibre has also been submitted to the Expert Referee for fibres attached to the Research Department, Mr. C. E. Collyer, who reports it to be in no way inferior to the Bahamas Sisal. He states that the sample was fairly well cleaned, but may be slightly improved upon in this respect.

The present value of Bahamas Sisal in the London Market is about £14 per ton against £12 to £12 10/- for Sisal of Yucatan growth. Mr. Collyer states that in his belief the price of the fibre will not go any lower than it is at present.

I am, Sir,

Your obedient Servant,

F. A. ABEL,
Secretary & Director.

J. H. HART, Esq., F.L.S.,
Royal Botanic Gardens, Trinidad.

RESULTS of the chemical examination of a sample of Sisal Fibre *(Agave rigida, var. sisalana)* grown in Trinidad. With the figures for the same fibre grown in the Bahamas, for comparision.

	Trinidad Sisal.	*Bahamas Sisal (for comparison.)*
Moisture (per cent.)	... 11.6	12.8
Hydrolysis (a) Loss	... 11.7	12.0
Hydrolysis (b) Loss	... 13.5	16.1
Mercerising, Loss	... 8.9	13.4
Gain by Nitration (total) ...	... 132.9	129.7
Acid purification, Loss ...	... 1.0	8.1
Cellulose (per cent.)	... 77·2	75.9
Ash (per cent.)	... 1.0	4.4

F. A. ABEL,
Secretary & Director.

7th August, 1895.

TRINIDAD.

ROYAL BOTANIC GARDENS.

BULLETIN

OF

Miscellaneous Information.

No. 5. JANUARY, 1896. Vol. II.

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PRICE: TWOPENCE.

Edited by the Superintendent Royal Botanic Gardens,
J. H. HART, F.L.S.

TRINIDAD:
PRINTED AT THE GOVERNMENT PRINTING OFFICE, PORT-OF-SPAIN.

1896.

156.—CRICKET AND TENNIS LAWNS IN TRINIDAD.

Europeans who come to the tropics generally bring their ideas on such things as the management of the tennis lawn with them. Unfortunately the solid rolled turf so easily obtained in a temperate climate is not to be found here; and the grasses of which the sward is composed are essentially distinct from the species which produce an English tennis lawn. That is to say, the difference between the grasses is as much marked as is the distinction between a goat and a cow. With the grasses of the tropics and the grasses of the temperate zones, likenesses can be pointed out, but when these are accurately noted, the enquirer finds that in some cases likeness or affinity disappears, and that many dissimilarities are to be found. With tropical grasses it is almost impossible to obtain what is known in England as leathery turf, for the simple reason that they are with perhaps one or two exceptions incapable of producing it. Hence, when a lawn has to be prepared in Trinidad, we have either to take the grass of the pasture and use it, or to plant grasses which will answer our purpose. Throughout the West Indies there are, however, many species of *graminæ* or grasses which are dwarf in habit, and when properly managed will produce good lawns. First and foremost among these is *Cynodon dactylon*, the "Bahama" or "Bermuda grass," "Indian Couch grass," "Doub" or "Doorva." This grass can be propagated by planting small tufts at short distances, and will cover a lawn in a short space of time. Another method of planting is to chop up the *rhizomes* or succulent underground stems into small lengths, mix them to the consistency of mortar with fine soil, and then spread it over the surface of prepared ground with a trowel, and in a few days grass will spring up with great regularity over the plot.* In some soils, however, this grass is overgrown by other species. In some parts of Jamaica this grass is overgrown by *Sporobolus Indicus*, *R. Br.*, the tufted "wire grass" of that Colony. In Trinidad, "wire grass" gives little trouble, is readily cut with the scythe, and does not spread to any great extent. In some districts in Jamaica the "wire grass" grows very rapidly and becomes quite a nuisance, and moreover the stem contains such a large amount of *Silica* as to make it utterly impossible to use the scythe for cutting it. In Trinidad on the contrary, the scythe is in constant use, and the grass is a useful one for making

* Kew Bulletin, p. 378.

hay and bedding for stable use. "Bahama grass" is sometimes displaced by *Paspalum compressum Nees*. This is the grass which, in the neighbourhood of the capital of Trinidad (Port-of-Spain), forms the major portion of the Turf of pastures and gardens. *Paspalum pusillum, Vent., P. distichum, L.* and *P. conjugatum Berg*, are grasses which also find a place, and together, they are strong enough in our soils to oust the "Bahama grass." In spots however, where there is a good supply of nitrogenous material, the Bahama grass can hold its own against all comers, and in such places it stands pre-eminent as the most suitable lawn grass, not alone for the even turf that it gives, but also for the ease with which it can be planted and kept in order when fairly established. *Paspalum compressum Nees* is a grass which makes a very low and even sward, and when well grown is preferred by some to Bahama grass. In Trinidad, especially in the neighbourhood of Port-of-Spain, all lawns suffer terribly from the ravages of the *mole cricket—Scapteriscus didactylus*—and I have been frequently asked to suggest a means by which this insect can be destroyed. This, however, is a question which has exercised the ingenuity of many, but so far as I can learn, with little or no success. Soap water and other liquids will cause the insects to emerge from their haunts in the lawns if poured into their burrows, and they can then be readily captured, but it would evidently be absurd to attempt to treat a savannah like the "Queen's Park," having an extent of 200 acres with soap water, and while such an area remains infested it is useless to expect that they can be prevented from attacking our carefully tended tennis lawns and cricket grounds. Many of our lawns are well kept, in all that relates to preparation for use, but it is in maintenance that less is done than might be done, and in a measure this appears to be unavoidable. In the tropics, Tennis, in many places is played all the year round, and therefore the grounds are in continuous use; and to be used, have to be mown. Now it seems hardly credible that any plant can stand having its head cut off once or twice a week throughout the year; and yet this is what is expected of the grass plant on Lawn Tennis Courts. Weakened by the continual cutting, trampled by the feet of athletic men and buxum lasses, squeezed and bruised by the heavy roller, it can hardly be expected to flourish or to thrive and form as it is required to do, the one inch of green carpet, which is the player's desideratum. It is not always the keeping of the lawn, but the continuous use of it, which is the cause of the untidy and patchy appearance which many of them present, even when not attacked by the "mole cricket."

Lawns require rest, and should also, where the ground is not rich in plant food, be supplied with manure in the form of a top dressing. Liberal applications of liquid manure are also good, but as the position of most lawns forbid the use of such material, the top dressing is the best way of supplying nutriment to the grass roots. Unless the grass plants on a lawn are in good health and vigorous in constitution it cannot be expected that they can withstand the constant cutting, trampling and rolling they are subject to, where regular play is the rule. Therefore players who wish to maintain their lawns in first rate order, should arrange for a "close season" of at least three months each year, during which the grass should be allowed to grow and strengthen itself for the fight it has to undergo during the remaining months of the year. It is quite true at the same time that by only playing at intervals a grass court can be maintained in fair order; but to secure this it is absolutely essential that it should not be cut too frequently. The top dressing for a tennis court should be prepared as follows:—Mix equal parts of finely sifted wood ashes, leaf mould, and good "top-spit" from pasture land well together, adding a good dressing of finely pulverized sulphate of ammonia to the heap (say at the rate of four cwt. to the acre) which should be turned at intervals of about 12 hours for three days previous to use. In applying the mixture place it in small and regular heaps at a time when the grass has been cut short. These heaps should be then raked down and the ground well watered. After the application the grass should be allowed to grow, in fact, the application should be made during the resting season. Smaller applications may however be made during the season, whenever a week or ten days' rest can be secured. The ground should be covered to a depth of one, two, or even three inches with the top dressing, and the grass should be allowed to grow through. When this is seen to be the case, the plot should be well rolled to make it firm, but afterwards, until the ground is again required for play, the use of the roller should be dispensed with. The application of a weak solution of sulphate of ammonia at intervals during the season is also recommended, as it not only strengthens the grass, but is also disliked by the mole cricket, as it has been found that mole crickets are present in smaller numbers after its application. If lawns are top-dressed in this way once a year and a resting season given, they can be maintained in a much better manner than under other conditions. It is well known that in some few places lawns exist, on which continuous cutting and trampling appear to have little effect, but if they are carefully

examined, it will be found that the nutritive properties of the soil in such places are such as we do not possess in the neighbourhood of Port-of-Spain. A recent analysis of a typical example of the soils of the Royal Botanic Gardens show that it is extremely poor, containing no less than 88 per cent. of *silica*, with 6 per cent. of the oxides of iron and alummia, a little over $1\frac{1}{2}$ per cent. of organic matter, a small proportion of lime, and mere traces of magnesia, potash and phosphoric acid. It can easily be understood how hard the conditions must be, under which the cultivator labours, who has to deal with a soil of this character. It can just as easily be seen that, many things cannot for a certainty be well grown unless they are supplied with the requisite nutriment by artificial means, and among these the grass of the tennis lawn; for it follows that, if the grass is sufficiently supplied with nutriment it must be stronger and better able to withstand the cutting and trampling, than if left to exist upon the small amount of nutriment it can gather from the atmosphere and from an almost barren soil.

On heavy clay ground, which possibly contains an abundance of nutriment, the grass may be practically starved by an undue amount of rolling, which would so solidify the soil as to render it almost impossible for the roots to permeate it, and to courts existing in such places, a top-dressing as before recommended, would be of great benefit, as it would afford nutriment on the surface which the roots are unable to obtain by piercing downwards owing to the hardened character of the soil, due to too much compression.

It is of course to be understood that all weeds should be removed when seen, as these not alone hinder the growth of the grass, but if of annual growth, will most certainly die out at certain seasons and leave bare patches. The cultivator should therefore select the perennial grasses he finds best and maintain those to the exclusion of all others.

It appears clear therefore that we can no more expect annual, or I may say weekly crops of grass (for all that is cut by machine or scythe is a crop, and is so much removed) than we can expect successive crops of other products without manure; and as we cannot dig and cover our manure without destroying the grass plants, we must perforce apply it in liquid form, or in the form of a top-dressing. If this is regularly performed, and a due period of rest given there should be no trouble—unless under exceptional circumstances—in maintaining the growth of a fine sward on tennis courts and cricket fields in Trinidad.

157.—"ARDRUE" OR "ADRUE."—*Cyperus articulatus, L.*

In the annual Report of the Department for 1892, I mentioned that supplies of the root of this Cyperus had been forwarded to an eminent firm of manufacturing druggists in the United States. From this material has been manufactured a "Fluid Extract" which is said to be useful in "atonic dyspepsia"—"Yellow Fever," and has a special reputation for checking excessive vomiting in various disorders. "It possesses a fine aromatic flavour, and produces a general feeling of warmth and comfort to the stomach." It is especially recommended as an *anti-emetic*. Samples of the drug may be easily obtained from the druggists, or may be seen at the office of the Royal Botanic Gardens at any time.

The plant has been recorded as a native of the West Indies by nearly all the older writers on West Indian Botany, and by some of these it is also stated to be a specific in cases of yellow fever. It was sent in a collection of medicinal products to the Indian and Colonial Exhibition from the Jamaica Botanical Department in 1886. It is rather a common plant in Trinidad and was found in 1849 by Dr. Cruger; in 1866 by Dr. Finlay at Oropuche, and specimens by both collectors are well preserved in the Departmental Herbarium. It has also been found in the St. Juan and Caroni swamps, from the former of which, our material was procured. The roots or *rhizome* is the part used, and of this only the tuberous portion, which if picked out with care and well dried in the sun will keep good for a great length of time.

It does not appear however that its merits have as yet been fully tested by the medical profession, and further trial will have to be made before it can take rank as a standard remedy of the Pharmacopœia, but at any rate it is certainly harmless, and well deserving extended trial.

In small communities "Remedies" having a local reputation are often used, and great faith in their virtue is found, not alone among the ignorant, but among the well educated. Still, year after year passes, and these "remedies" are not brought into use in the medical service. Of late years, however, some of this class of medicines have been examined by competent men in experimental laboratories, and in a few cases the results have proved decidedly encouraging. On the other hand, however, not only have many of the so-called "remedies" been found to be utterly worthless, but in certain cases they have been proved to be of a highly dangerous character, and not suitable for ordinary administration.

Great care, therefore, should always be exercised, first to ascertain whether the remedy given is a harmless one. This can generally be ascertained by submitting specimens of the plants used, for Botanical examination; as the general characters of the various orders in relation to their medical properties are fairly well known, and it can generally be decided when a "remedy" should be looked upon with suspicion, or pronounced harmless material. In recent years, however, before a new drug or a new "remedy" gains admission to the Pharmacopœia, it has to pass through many tests and many trials by competent authority; and until it has passed these successfully, the medical profession as a rule will not attempt to use it. In this they are quite justified, for it is certain that it is safer to use an old well-established and well-known remedy, than to make use of one, the properties of which are little known, and whose examination has not been fully carried out.

Some one however must make a start, and in the case of medicines which it is known "can do no harm, if they do no good," there is little risk in actual use of them; but in the case of remedies of a poisonous or suspicious character, it is easily seen what a large amount of care must be exercised in making trials, and such trials it is evident should not be carried out except by those whose knowledge of medicine and medical practice is of the highest standard; in fact, it can hardly be done except by physicians who devote their lives to scientific and experimental rather than to "family practice," and few others can be induced to attempt it, as the responsibilities it incurs are of such a nature as not to be lightly undertaken.

It will be seen, therefore, how difficult it is for a new drug or remedy to attain standard rank, and we cannot wonder at the length of time taken to place it in the lists of the various Pharmacopœia. In speaking of "Ardrue" it can be shewn that it has been known for many many years as a reputed cure for yellow fever and vomiting in excess from various causes, and yet it is only recently that we have seen it made into a preparation suitable for easy administration. Whether extended trial will prove it to be valuable or otherwise, time alone can prove, but speaking from personal use of it, it can be declared that it is pleasant to use, and is certainly efficacious in removing the unpleasant symptoms in atonic dyspepsia, but whether it will ever attain flag rank by being placed on the Pharmacopœia as a standard preparation, is a question which has yet to be decided.

158.—GARDEN SEATS.

For the comfort of visitors to the Gardens there has been imported a large consignment of garden seats (40) the ironwork for which was supplied by an English firm. The seats are of several patterns and were placed in position in the Gardens in the months of May and June, 1895.

159.—A FODDER GRASS.—*Pennisetum orientale, Rich. (Pennisetum triflorum Nees).*

This grass was introduced from the Himalayas to the Jamaica Gardens about the year 1884, and in compiling the Annual Report of the Jamaica Department for 1886, while in charge as Acting Director, I mentioned it as "likely to prove an introduction of no little value to proprietors of mountain estates." During 1886 seed was distributed to various gardens, and from this distribution the late Mr. John Gray who was in charge of the St. Lucia Gardens at the time, succeeded in raising numerous plants. Ascertaining from Mr. Gray that the plant was thriving in St. Lucia, I asked for seeds, and these proving fully fertile, afforded us a fine set of plants. These have now been tested for several years in our experimental grounds, and have shewn, that not only is the grass suited for hill cultivation, but that it thrives well on the plains, and produces large quantities of fodder. It can be readily propagated by division of the stools, as well as by seed, and stands cutting frequently. It is not thought likely that it will become useful as a pasture grass, but as a cultivated fodder it will possibly prove equal to if not superior, to "Guinea grass"—*Panicum maximum*—especially in soils where the latter is not found to thrive.

There is no difficulty in propagating it by seed, if the latter is carefully sown as soon as ripe, but if the seed is taken before being mature or after it has ripened for some weeks, there will of course be difficulty in getting it to grow.

160.—"TABASHEER."

Mineral deposits in wood were mentioned in No. 6 of our first series of the Bulletin. The specimen found at that time was taken from fissures in the wood of *Hieronyma alchorneoides* or the "Tapana" tree of the Trinidad woods. It was analysed by Professor

McCarthy and found to contain 85·81 per cent of calcium carbonate.

Recently we have discovered specimens in bamboo joints which were being cut for use as flower pots, of the material known as "*Tabasheer*," of which specimens were shown by the Director of Royal Gardens, Kew, in 1888, before the Linnean Society. The material is interesting as being a mineral deposit taken up by a plant, re-formed and deposited in its interior.

161.—NATURAL HISTORY NOTES.

No. 23.—The "Termite" mentioned in Circular Note No. 22 as attacking sugar cane during growth and doing considerable damage, has recently been determined as *Termes tenuis : Hagen.* It is said to be the same species which destroyed the wooden buildings in St. Helena to such a degree that the Capital had practically to be rebuilt. From this it may be judged what a powerful destructive creature exists in our midst, and a good watch should be kept on its proceedings.

No. 24.— *Cutiterebra funebris, Austen* (*new species*). Under this name the insect referred to in Circular Notes 14 and 17, has recently been determined by Mr. E. E. Austen of the British Museum. The specimen from which the description is taken was the one bred in the Royal Botanic Gardens, and afterwards sent on for determination to the British Museum authorities, and is the only one as yet recorded. The insect is a large two-winged fly, whose *larvæ* is locally known together with that of a species of *Dermatobia* as the "Mosquito Worm," from the idea that it is produced by the agency of a large knat or mosquito. Similar skin-borers are known to attack man, dogs and several rodents and marsupials. It appears possible however that the fly which attacks one animal may not be that which attacks another, although the *larva* or "worm under the skin" may present a similar appearance. This is shewn by *Dermatobia* attacking man while *Cutiterebra* attacks the lower animals, the form of the insect when under the skin being practically indistinguishable. It is considered possible that the insect which attacks the dog may on further examination prove to be a different genus to either of those mentioned, and it therefore requires further study to prove whether *Dermatobia* attacks the lower animals as well as man, and *Cutiterebra*, man as well as the lower animals.

162.—LATANIA BORBONICA, *Lamrk.—Livistona chinensis, Mart.*

This is a plant well known to cultivators of tropical plants throughout the world, and is said to have been introduced into England from South China in 1818. It is known principally in the markets for decorative plants as *Latania borbonica*, and from its hardy character, its elegance, and the ease with which it can be brought to perfection as a decorative plant, it probably ranks as the first of all palms for this purpose. It is especially useful as a decorative plant for the dinner table or saloon, when grown in small pots in plenty of light.

The palm when mature produces seed freely by the bushel, and the best table plants are seedlings of two to three years old. The plant requires but very little shade even when grown in pots, and when planted in the open, none whatever. In the open ground the tree begins to form stem at about six years of age, at which time a head composed of forty or more well developed leaves is quite common, and mature specimens reach to the height of 50 or 60 feet, as can be seen at any time by visitors to the Royal Botanic Gardens, where several large and well developed specimens are growing, planted many years ago by the officer who then had charge of the Botanical Department.

Livistona chinensis is a very suitable plant for forming avenues, and during the younger periods of its growth is very handsome. Even when it reaches maturity, its straight columnar stems terminated by a fine panoply of leaves, makes it very conspicuous and interesting.

The plant is one which thrives admirably in Trinidad, and large numbers are grown commercially for export to the United States, by persons skilled in its cultivation who have been located in the Colony specially for this purpose.

The leaves of the plant are useful for making ladies' fans, and it could possibly be grown in large numbers to great advantage for this purpose, and the manufacture of the fans would open out employment for numerous persons of a class for whom there is at present no suitable employment.

163.—LIGNUM VITÆ.—*Guaiacum Officinale, L.*

In Trinidad this tree blossoms in May, and is a highly ornamental as well as a useful one. It thrives best in well drained districts, and stands drought better than many trees. Saint Domingo

wood is quoted in the London Market at £2 to £12 per ton, while for other West Indian Islands the produce ranges from £3 to £9.

Lignum Vitæ is a slow growing tree and takes some years to attain to any large size, but as it practically costs nothing for cultivation during the period of growth, small sums can be very economically expended in planting up estates' pastures, with trees which will ultimately afford such a valuable product.

Not only is the plant valued for its wood, but the gum obtained from the stem is used in medicine under the name of *Resina guaiaci*, which is reputed as a diaphoretic and alterative, and is prescribed in cases of gout and rheumatism. It was also held in great repute in former times for the treatment of many other diseases, but in the modern practice of medicine, it is not so frequently prescribed. The bark is used in Trinidad for preparing an effervescing drink locally known as "mawbee," and vendors of this production may be commonly seen at the street corners disposing of the drink to passing workmen.

The wood is principally used for turnery purposes, and is made into "sheaves" or wheels in ships' "blocks," caulking mallets, skittle balls, Bowls for the game of "Bowls," and for many like purposes. Sometimes it is used for machine bearings and for similar purposes, where its quality of hardness and durability renders it preferable to metals of any kind.

The gum may be readily extracted from the wood by making an incision in the middle and the building a fire at both ends of a log.

The tree thrives well in Trinidad, especially in the drier districts, it grows readily from seed, and is really a very valuable and ornamental plant.

164.—GINGER.—*Zingiber officinale, L.*

GINGER has hitherto not been generally cultivated in Trinidad, but it has been clearly shown by experimental cultures at the Convict Depôt, Chaguanas, and by several trials at the Royal Botanic Gardens that there is nothing whatever to hinder the production of a fine quality of ginger, fit for the European or American Markets.

Mr. Fawcett, the Director of the Botanical Department in Jamaica, has reported (5th April, 1894) that the export from that Island has gradually increased from 9,927 cwt. in 1887 to 14,932 cwt. in 1894, and that a considerable area of new land is cleared each year for this crop.

Our experiments tend to show that the soil in Trinidad is eminently suited for the growth of this plant, and also that the succulent character of the rhizome, so much valued for manufacturing the preserved "Chinese Ginger," can be produced at will by the application of *suitable manure* in sufficient quantities.

It is a cultivation that gives quick returns, and the preparation of the product is very simple and easily learnt; the chief difficulty being to get the rhizomes dry without becoming mildewed. A most suitable place for such a purpose would be the drying floor of a "cacao house" especially those which have appliances for drying in wet weather.

The highest price of Jamaica ginger as given in the Public Ledger Market Reports for 1895 is £5 per cwt.; while for the corresponding month of the preceding year the price was £5 10/- per cwt., and the minimum price for the lowest qualities for the same periods was £2 14/- for 1895, and £3 1/- for 1894.

It is a cultivation suitable for small settlers with families, as the labour of children can be very economically employed in the preparation of the produce. In Trinidad there exists large areas of virgin lands which are well adapted for the production of ginger of first-rate quality, but besides these areas, there is plenty of land available near to villages or townships on which good crops of ginger could be profitably raised.

Ginger is said to produce crops of 2,000 lbs. to the acre, but if all land could be cultivated as garden plots, much heavier crops than this might reasonably be expected.

165.—FIBRE FROM THE "GRU-GRU," OR "GROO-GROO" PALM.—*Acrocomia sclerocarpa.*

At the Indian and Colonial Exhibition there was exhibited a fibre said to be prepared from the leaves of the above palm, and on which the experts reported very favourably as follows :—"THIS FIBRE "IS DISTINGUISHED FROM ALL OTHERS OF ITS CLASS BY ITS REMARKABLE FINE-"NESS AND GREAT STRENGTH, ON WHICH ACCOUNT IT COULD BE USED FOR A "VARIETY OF PURPOSES." The fibre was sent from the Island of St. Vincent.

Wishing to know more of the matter, I wrote Mr. Powell who is in charge of the Botanic Gardens in that Island, and he reports as follows as to the way in which it is prepared :—"The pasture boys turn back a portion (about 3 or 4 inches) of the point of the leaf or

leaflet, and by means of a sharp pull or jerk a portion of the fibre is extracted. The leaves must be neither too young nor too old. Some of the boys have attained to great proficiency in the art of extracting the fibre, but the process is naturally very slow and very tedious. It is used principally for fishing lines and whip-lashes."

The above palm differs from that known by the common name of "Gri-gri"—which botanically is *Martinezia Caryotæfolia*—but from this palm also, a fibre is produced which is said to be even stronger than that produced by the "Gru-gru."

Both these palms produce seeds which contain a large proportion of a sweet palatable oil, which in St. Vincent is extracted and used for cooking purposes. Children are very fond of cracking the nuts and removing the kernels which are in both palms sweet and wholesome to eat, though rather hard for all but the teeth of youth.

The wood obtained from the outside of the stem is very hard, heavy and durable. It is made into walking sticks, and is sometimes used for mouldings, its dark colour forming a fine set off to a panel of pine. The wood possesses the characteristic of never bending, warping or curling longitudinally, and it would probably be extremely useful, properly made up, for first-class billiard cues. The only objection being its weight, a difficulty which would probably be overcome by the manufacturer.

166.—CIRCULAR NOTES.

No. 26.—This number was issued so as to enable planters to avail themselves of the opportunity of witnessing our annual course of grafting, and to give them an opportunity of seeing the crops produced by good culture on the Garden coffee trees. A goodly number of gentlemen interested in agricultural pursuits availed themselves of the opportunity and have expressed to us their appreciation of the privilege which was afforded them.

Botanical Department, Trinidad.—Circular Note, No. 26.

Grafting the Mango.— Culture and Pruning of the Coffee Tree.

Persons interested in learning the process of grafting the Mango can see the operation being carried on at the Royal Botanic Gardens on Tuesday, Wednesday and Thursday of each week during the month of August, 1895, from 1 p.m. to 3 p.m.

A short lecture will be delivered each day by the Superintendent on the principles and practice of grafting.

Between the same hours and on the same days instruction will be given on the culture and pruning of the Coffee tree *(Coffea Arabica)*.

The days set apart for instruction will be the 6th, 7th, 8th; 13th, 14th, 15th; 20th, 21st, 22nd; 27th, 28th, 29th August, 1 p.m. to 3 p.m.

Notice should be given of the intention to attend the lectures before the 6th of August.

The crop of Coffee now on the trees under culture and the absence of it on untreated trees affords good evidence of what may be done by proper treatment and culture.

J. H. H.

29th July, 1895.

Botanical Department, Trinidad.—Circular Note No. 27.

"Silica" in Grasses.

In the Liguanea plains of Jamaica one of the most common pasture grasses is that commonly known as "wire grass," and botanically as *Sporobolus Indicus*. This grass is also indigenous and common in Trinidad.

In Jamaica this grass is most difficult to cut, it being next to impossible to maintain an "edge" upon any tool or instrument made use of for that purpose.

In Trinidad on the other hand the same grass is cut with ease, either with the scythe or other instrument.

The true reason for these facts not being clearly recognised, mature samples of both grasses were procured with the view of having the amount of *Silica* in each accurately determined.

An analysis performed at the Government Laboratory by Professor Carmody gives as follows:—

Percentage Silica.

Sample "A" Jamaica—4·50.—Sample "B" Trinidad—2·69.

This result was anticipated, and the large amount contained by the Jamaica sample would appear to fully indicate the reason for the difficulty which is experienced in cutting the grass in our sister island.

Why the same species of grass should develope more *silica* in one climate and soil than in another would appear to be a question worthy of further investigation.

The Sugar Cane is a grass, and if the crops of various countries were analysed in a similar manner as these samples, it is probable that comparative results of great interest to planters would manifest themselves, as it would appear to be evident that a hard-skinned cane, or that containing the most silica would certainly be able to withstand the attack of insect and vegetable parasites, far better than one having a soft and easily pierced skin.

J. H. H.

2nd September, 1895.

CIRCULAR NOTE No. 28.

Seedling Sugar Canes.

IN my annual report I mentioned page 9, that the experiments of Messrs. Jenman and Harrison of British Guiana, on the growth and yield of seedling canes had been fully supported by trials carried out at the sugar experiment in Louisiana, U.S.A., under Prof. Stubbs.

Further news has now been received that seedling No. 95 has again surpassed all others, Prof. Harrison showing that it has given the richest juice for the fourth year in succession. He futher states that third ratoons gave a yield of some 26 to 27 tons to the acre.

The results obtained in our experimental plot also confirm the fact that the seedling No. 95 is superior in yield to any of the established varieties now grown, and further experiments are now being undertaken which it is hoped will confirm these first tests.

We have in the Gardens four of the best seedlings, and these are being propagated with the greatest possible taste, so as to give them more extended trial on estates, as it may be clearly seen that a cane which will give on experimental fields a yield of some 18 to 20 per cent. over all others is one which deserves very high estimation.

J. H. HART, F.L.S.

6th December.

BOTANICAL DEPARTMENT, TRINIDAD—CIRCULAR NOTE No. 29.

Yield of Seedling Sugar Canes, &c.

CONSIDERABLE interest has been taken in the contents of Circular Note No. 28 relating to the yield of new varieties of seedling canes,

and many enquiries have been received from planters in regard to their origin, &c.

Canes Nos. 95, 74, 78 and 102 were raised in the Botanic Gardens, British Guiana, and were received by us in November, 1894, direct from Demerara, a single stool of each of the above with many others of high value being sent to our Gardens by Mr. Jenman in that month.

The propagation of the best of these canes is being proceeded with as fast as possible so as to be able to give at a stated time equal supplies of cuttings to all applicants.

The report on these canes for 1893, 1894 and 1895, is not yet published, but from information received I am in a position to state that the returns of 1892 (here given) are fully supported by those of the three following years. In the words of a correspondent, if this experimental yield can be maintained there is little reason to fear extinction by beet, and no need to trouble about countervailing duties.

No.	*Tons.*	*Sp. Gr.*	*Sucrose.*	*Glucose.*	*Purity.*
95	33	1094	2·228	·048	91·1
74	34	1090	2·184	·063	93·2
78	47	1078	1·722	·080	85·2
102	33	1094	2·202	·068	90·1

J. H. HART, F.L.S.

12th December, 1895.

167.—ANALYSIS OF GARDEN SOIL.—*(2nd Article.)*

Under the above heading in article No. 117 p. 43, I gave a short account of the inferior character of the soil of the Royal Botanic Gardens. Since writing that account I have received from Professor Carmody, F.I.C., F.C.S., Government Analyst, the details of an analysis of two samples taken with the especial view of shewing the main characteristics of the soil with which we have to deal.

The estimated value of the soil as given in article 117, is fully confirmed by the analysis furnished. It shews in fact that the soil is even poorer than we could possibly have anticipated. There can no longer therefore be any doubt as to the method of culture to be pursued, as it is evident that fertilizing material in the form of manure of almost any kind may certainly be applied with the greatest advantage, for the fact is patent that in such a soil, plants,

excepting perhaps those which are deep feeders, without liberal supplies of manure, will suffer from starvation. As the same class of soil extends southward through the Queen's Park in the direction of the town of Port-of-Spain, the analysis of our soil will afford a hint which should not be lost sight of by those having land under cultivation. The following is the analysis :—

Samples of Soils received 9th February, from the Superintendent of the Botanic Gardens.

	Sub-soil. A.	*Surface.* B.
Water, (hygroscopic	0·720	1·100
Loss on ignition, (* organic and volatile matter)	1·640	1·700
Silica	89·768	87·660
Oxides of Iron and Alumina	6·370	7·420
Lime	0·533	1·187
Magnesia	0·018	0·093
Potash	0·200	0·005
Soda	0·236	0·021
Phosphoric Acid ($P_2 O_5$)	0·007	0·013
Sulphuric Acid (SO_3)	0·002	0·018
Chlorine	0·005	0·002
Carbonic Acid (CO_2)	0·358	0·423
Loss	0·143	0·358
	100·000	100·000
* Containing :—		
Carbon	0·136	1·036
Nitrogen	0·098	0·057

Both soils show a deficiency in organic matter, potash, magnesia and phosphates.

P. CARMODY,
Government Analyst.

Government Laboratory,
29th July, 1895.

It is evident that with soil of the description obtaining at the Royal Botanic Gardens, a large proportion of the material constituents for plant growth must be furnished by the air, by the annual Rainfall or by artificial means. It is therefore important for the cultivator to know the amount and composition of the annual Rainfall and also of the chemical constituents of the atmosphere before it can be accurately shewn what is really the best manure to apply and the best methods of applying it. An example of an effort in this direction is afforded in the report issued conjointly by the Government Botanist and Government Analyst of Demerara on experimental cane cultivation. The Rainfall for 1891 is shewn

to have contained 124·29 lbs. chlorine and 4·08 lbs. nitrogen per acre, and that for 1892, 109·7 lbs. chlorine and 2·27 nitrogen per acre. Such examinations are extremely interesting, and allowing for known sources of error, must be of the greatest use to the cultivator of the soil in country where *climate* plays such an important part in supplying material for plant growth as it does in Trinidad.

168.—THE MANUFACTURE OF CASTOR OIL.

[*Extract from Pharmaceutical Journal, May, 1895.*]

"The system hitherto in use at the centres of this industry involves, first of all, the separation of the husks from the kernels, which are then heated and moulded into cakes and placed in horsehair bags or cloths and submitted to pressure, which is almost invariably obtained by manual power in India. In Marseilles and other centres of Europe where castor oil is manufactured, hydraulic pressure is usually applied. In the case of East Indian oil, the total oil taken from the seed is usually extracted at one operation; but where hydraulic pressure is employed it is found more economical to press twice, and by this means extract a larger percentage of oil from the seed. The Calcutta marc from castor crushing contains about 20 per cent. of oil, whereas by the other systems it is considerably less than half that amount. This mode of manufacture has many objectionable features, being complicated and unnecessarily expensive, and most injurious as regards the quality of both the oil and the cake so produced.

The system adopted in the present case has been introduced by the British Castor Oil Company's Engineer, who has invented and patented most of the apparatus employed. Guzzerat seed is exclusively employed for the preparation, both of the medicinal and the lubricating oils, so as to ensure a uniform product, as it is the only variety which can readily be obtained free from admixture.

The first floor of the building is used as a granary, and here the seed is carefully sifted, so as to get rid of any extraneous matter. It it is then shot into a movable hopper, which is drawn along the top of the large horizontal hydraulic press situated on the ground floor. When the press boxes are open the seed is discharged through the aperture at the bottom of the hopper, and fills the boxes. A pressure of 480 tons is then applied, and the oil is expressed, falling upon a movable plate and into drains provided for its reception along each

side of the press. From these sources it flows into a linen strainer, which separates the crushed seeds which have escaped from the press, and then into an adjacent tank. Here, when it reaches a certain level, the stopcock of a vacuum pipe in connection is opened, and the oil is immediately drawn through a system of pipes into a cylinder on the first floor in another part of the building, whence it passes down into the first filter, which takes out all mechanical impurities. Thence it is drawn into another cylinder adjacent to the first, one being empty whilst the other is full, and *vice versâ*. At this stage it may be noticed that the oil is perfectly clear and bright. However, in order to get rid of microscopical impurities it passes from the second cylinder into a second filter, whence it is drawn into the bottling machine, where, as a final precaution, it is again filtered before being run into the bottle. This apparatus, which has been patented, is admirably adapted for the purpose, and, as a vacuum is formed in the bottle when the outlet taps are opened, cracked bottles are at once detected. The temperature both of the filling and bottling rooms is kept uniform day and night.

It may here be remarked that the system of filtration is throughout entirely mechanical, no chemicals being employed in any part of the process. In the case of the medicinal oil four separate cloths of a special kind of twill are arranged in each filter. The plant has been erected about four months only, and medicinal oil is expressed during the first half of the week, the press being afterwards used for the extraction of lubricating oil from the residue; but from the press forward the two varieties of oil pass through distinct and separate systems of pipes and refining plant so as to avoid any possible contact between them. Shortly, however, the two varieties of oil will be made continuously, a separate press being used for each. It may here be noted that the oil expressed by this process is absolutely "cold drawn," the temperature of the press-room averaging 47° F. This is of interest, in view of the fact that very little, if any, of the so-called "cold drawn" castor oil at present in the market is properly so termed. The oil, in all its stages of manufacture, has a simple bland taste, resembling olive or almond oil, in marked contrast to the nauseous taste usually associated with it. The press takes a charge of 2 cwt. of seed at each operation, the time occupied in expressing the medicinal oil being about seventeen minutes. An important feature of this system of vacuum filtration is that from the time the oil leaves the collecting tank until bottled it is never exposed to the air, and the natural moisture of the oil is dissipated mechanically.

After the seed has undergone the first pressure, whereby half of the available 44 per cent. of oil has been collected for medicinal purposes, the residual cake is again submitted to the same treatment. This takes out an additional 16 per cent. of oil finally leaving about 6 per cent. in the marc. The second product goes through a similar process to the first, except that it is only filtered once, and that three instead of four cloths are employed for the purpose. The finished product, which is sold exclusively for lubricating purposes, as a matter of fact closely resembles the medicinal oil, but has a slightly nauseous taste. The marc left after the second extraction is at present entirely used for horticultural purposes under the name of "Foodite." Analysis shows it to contain 7·28 per cent. of nitrogen, equivalent to 8·84 per cent. of ammonia.

The present director was engaged in the manufacture of castor oil in India for some twelve years, and the process now employed by him embodies all the best points of his experience in the different oil-producing centres. In Calcutta alone there are more than 300 mills engaged in crushing castor oil seed, but the system there employed, as already explained, involves the husking of the seed prior to submitting it to pressure. However, a mill is being erected there in which the present process has been adopted. The advantages claimed for crushing the whole seed are that the process is much more expeditious, less costly, and that there is no danger of internal pressure, such as is liable to occur when the kernels only are submitted to pressure.

Obviously this system of extraction is applicable to many other seeds besides castor. In fact it has been tried with extremely satisfactory results with linseed. In this instance, after about 27 per cent. of oil had been extracted by cold pressure, the seed was but little altered in appearance, and would doubtless be very useful in that state for cattle food, the expense of making it into cake being unnecessary. Besides this, several purposes for which it could with advantage be used pharmaceutically, suggest themselves. The most important economic use of the seed, however, is as a source of oil."

169.—BOTANICAL NOTES.

No. 1.—*Polypodium trinidadense, n. sp., Jenman.*

Under this name there has recently been described a fern which was collected by the writer at Maracas Falls some five years since.

A plant brought in at that time has been under cultivation at the Gardens, but only produced fertile fronds for the first time during 1895. The following is the description by Mr. Jenman :—

POLYPODIUM (*Phegopteris*) *Trinidadense, Jen., n. sp.*

Stipites, 6–9 inches long, void of vesture, slightly channelled, brownish green; *rachis* similar; *fronds* pinnate, chartaceous, pale green, naked 1–2 feet long, 1 foot or over wide, not reduced at the base, and very slightly at the apex terminating in a simple, linear-ligulate unlobed pinnæ, conform to the lateral ones; *pinnæ* spreading horizontally, almost sessile linear-ligulate 5–6 lines wide, 9 inches long, finely serrato-accuminate, the base truncate, not widened, slightly contracted in the lower ones, the margins uniformly throughout sharply dentate (or bi-tridentate); veins copious, simple, close grouped, running to the margin, terminating in the serrations; sori copious, medial on the veins, forming two or three rows, no involucre observable.—TRINIDAD, HART, 1895.

At first sight this might be mistaken for *Polypodium flavo-punctatum*, Kaulf., a plant very common in Trinidad, but which on comparison is seen to be very distinct. The pinnæ are narrower in this, they are uniformly free at the base, slightly narrowed there, with a terminal one to the frond, simple, only serrated just like the lateral ones, and the translucent spots are quite absent; whereas, *P. flavo-punctatum* has pinnæ twice or thrice as broad, with copious translucent spots, the upper pinnæ roundly lobed along the margins, freely translucently spotted, the upper two-thirds broadly aduate, and decurrent on the rachis, passing gradually into the lobed apex of the frond, there being no distinct terminal pinnæ. Plumier's fig. Fil. T. 38 is a very good figure of *P. flavo punctatum*, and shows clearly how distinct these two species are.

DEMERARA,
30th July, 1895.

No. 2.—*Cynometra trinitensis, Oliver.*

In the front portion of the Royal Botanic Gardens facing south, stands a large tree which has long been a favourite with visitors, on account of the dense shade it affords at all seasons of the year. It stands some sixty feet in height with a spread of branch about the same in diameter as the height. This tree produces a pod or bean

with a hardened exterior, circular in form, and containing a single seed in each. The pods are about two inches in diameter, resembling a golf ball, and are the ready-made playthings of the children who daily congregate beneath the shade of the tree. The form of flower and of pod is somewhat peculiar, so much so, that it is hard for the ordinary observer to believe that it really belongs to the order Leguminosæ, or the order to which our common peas and beans and many of our pod bearing forest trees, such as the "Saman" *Pithecolobium Saman* and others, belong. The tree in question is probably somewhat over forty years of age, and was formerly known as *Cynometra cauliflora, L.*

On specimens being sent to the Royal Gardens, Kew, however, Professor Oliver decides it to be a new species, which will be described and figured by him in Hooker's *Icones Plantarum* as *Cynometra trinitensis, Oliver.* It is a tree which grows freely, producing handsome dark green foliage, and is well worthy of a place in any tropical garden where the same conditions obtain as those which are present with us in Trinidad.

No. 3.—*Asplenium Nidus, L., var. A. Musæfolium, Mett.*

On my arrival in Trinidad in 1887, I found in the Gardens a large plant of the above-named fern growing in a tub under partial shade. So well was it thriving that it was resolved to leave it in the position in which it was found, when a rearrangement of the nurseries was in progress. The result has been a maintenance of the same state of vigorous health, and an increase in size which makes it one of the features of the Garden. The following are the dimensions :— Diameter, 9 feet 9 inches ; height above tub, 6 feet ; average length of leaf, 6 feet ; width of same at widest part, 12 inches. The plant produces a large quantity of spores annually, but we have not as yet succeeded in raising young plants.

No. 4.—*Trichopilia hymenantha, Rchb. f.*

This is a small orchid indigenous to Trinidad, which has been brought in by local collectors from time to time since 1887, but now named for the first time from specimens sent home to the Royal Gardens, Kew.

170.—"THE LOQUAT."—*Eriobotrya Japonica, Lindl.*

This tree is a native of China and Japan. It grows in the Royal Botanic Gardens to a height of thirty or thirty-five feet, and in favourable seasons gives a fair supply of fruit. The latter, though sought after by the youth of the place, cannot be said to rank as a first-class dessert fruit in Trinidad, whatever they may be in their native country. When in good condition, however, they have a pleasant flavour, and possibly in drier districts, fruit may be produced of superior quality. Plants are readily raised in quantity from the seeds produced. The tree belongs to the order *Rosaceæ* to which the pear, the apple, the cherry, the strawberry, and other European fruits belong.

171.—GIANT CACTUS.—*Cereus peruvianus.*

Growing near to the office of the Gardens is a large plant of this Cactus which annually produces a large number of pure white flowers, sometimes as many as a thousand at a time. Blooming however as they do during the hours of night and closing early in the morning, it is seldom that visitors have an opportunity of witnessing the display of bloom. The season during which flowering takes place is during the months of May or June according to the rainfall. Seen in the early morning when in full flower, the plant presents a beautiful appearance, but for the rest of the year its huge stems, some 30 feet in height are, though quaint and interesting, anything but beautiful objects.

172.—SHALLOT.—*Allium Ascalonium, L.*

"Although botanically very closely allied to the cultivated onion, "the shallot in its manner of growth differs from it completely from "a horticultural point of view."—(*Vilmorin-Andrieux.*)

The true shallot is a native of Palestine. In the West Indies this useful esculent is cultivated in many places but not generally. It can be profitably cultivated at low altitudes if grown in well manured beds at distances of six inches apart and planted so as to ripen in the dry season. It is frequently used as a component part of West Indian pickles.

173.—THE GROUND NUT.—*Arachis hypogea, L.*

"Ground Nut," Monkey Nut," "Earth Nut," "Pindar," "Pea Nut," "Pistache de terre" and "Earth Almond." Professor Church in food grains of India gives the following Eastern names for the

plant. *Hind.*—Mung-phullie, Bûe-mung, Vilayeti-múng. *Punjaub.*—Chawal mügra. *Beng.*—China-badano, Alke-kulay. *Tel.*—Nela-sanagalu. *Tamil.*—Nelay-cadalay. *Sanskrit.*—Bochanaka.

This long string of names, which could be easily extended, tends to show that the cultivation of this plant is an industry widely distributed throughout the world, in countries having suitable soil and climate for its growth. A suitable climate without a suitable soil would be useless, as the plant almost entirely depends upon the physical character of the soil to enable it to produce its fruit to perfection. It is quite useless to plant the "Ground Nut" in clay or hard soils, as it would be physically impossible for the plant to bury its legume beneath the surface, so as to allow of its full and proper development. The ground nut is an annual herb with procumbent branches. It belongs to the order *Leguminosæ*, and bears small yellow pea-like flowers borne on long stalks, which, after flowering, curl downwards, and force the immature pod into the soil sometimes as deep as three inches or more below the surface where it fully developes and ripens.

Good ground nuts have been grown in Trinidad, and have frequently been shewn at our exhibitions of produce, but nevertheless, the market is principally supplied with produce which is of American growth. Most of the attempts to grow the plant have I believe been made in *unsuitable soil*, and where any success has been obtained, the soil in which they have been grown has been artificially prepared.

In some districts in Trinidad there will probably be found soils which are eminently suited for this cultivation. These are best described as soft sandy loams which, either dry or wet, maintain their porous and easily penetrated character. Such soils usually contain a sufficient amount of organic matter and other constituents of plant food as will enable a plant like the "ground nut" to be economically grown.

In the district of Oropuche and Siparia, soils are to be found in which a walking stick can readily be pressed down one or two feet deep, and it is such soils that should be used for the culture of the "Ground Nut" or "Pistache." The climate is all that could be desired for the cultivation, the market is a good one, as shewn by the annual importations, and it is only necessary to plant in suitable soil to obtain a paying crop.

The plant is stated by Prof. Church to be "probably of American origin;" and this view is also taken by DeCandolle who ascribes

it to the Brazilian Continent. It having been shown that in that region, six other species of *Arachis* were long since discovered; and he further believes it to have been introduced into Africa by slave ships at a very early period, and where it is now largely cultivated.

Professor Church gives the composition of the pea-nut as follows :—

Water	... 7·5
Albuminoids ...	... 24·5
Starch	... 11·7
Oil	... 50·0
Fibre	... 4·5
Ash	... 1·8
	100·0

He also says, "as half the weight of pea-nuts is oil, they require a considerable amount of starchy food in order to become a wholesome and economical article of diet. Pea-nuts, after the greater part of the oil has been extracted by pressure, yield a cake well adapted for feeding cattle."

The oil when "cold-drawn" is almost colourless, of agreeable faint odour, and bland olive-like flavour. "It is employed for cooking and burning, and as a general substitute for olive oil; indeed, large quantities are passed off as olive oil in European markets."—(*Spons Encylp.*)

In Trinidad the common name for the ground nut is "*Pistache*" or "*Pistache de terre*," but it should not be confused as is sometimes done, with the veritable "Pistachio nut" of Europe, which is the seed of a tree known as *Pistachia vera*, a native of Western Asia. The seeds of this tree are generally eaten in eastern countries either "simply dried as a dessert fruit somewhat resembling almonds, or made into articles of confectionery." The harvesting and curing of the crop of the "ground nut" is simple; all that is required, is to remove them from the ground and wash and dry them thoroughly, but they should be sized before being sent to market, as the large ones are used for dessert and confectionery purposes and the smaller ones for making oil for household use to which they are well adapted.

In India large areas are grown. Dr. Watt in the "Agricultural Ledger," published in Calcutta, says that as much as 112,000 acres were under cultivation in 1879. In 1878 the imports into France were valued at 30,239,602 francs—the largest portion of which was

imported from the West Coast of Africa. The import of this seed seed so largely into the South of France is significantly corroborative of the supposition that it is largely used for making substitutes for olive oil.

In a return published by Dr. Watt, 1,536,905 cwts. of nuts of the value of 9,597,275 rupees, and oil to the amount of 20,973 gallons, valued at 28,745 rupees, were exported from British India.

TRINIDAD.

ROYAL BOTANIC GARDENS.

BULLETIN
OF
Miscellaneous Information.

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Edited by the Superintendent Royal Botanic Gardens,
J. H. HART, F.L.S.

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1896.

174.—WATER-CRESS.—*Nasturtuim officinale, B. Br.*

ALTHOUGH we seldom hear the familar Coster's cry of "Fresh Water-creases" in the streets of West Indian Towns there are however but few markets in these Towns in which Water-cress cannot be purchased. The Cress grown, though perhaps not quite so succulent and vigorous, as would be found in Europe or America is of very fair quality, and makes a very agreeable salad for the table. The plant is naturalized in many of the rivers and streams of the different Islands and its quality depends much upon the character of the streams. A sluggish stream, of pure water flowing over a sandy bottom is the place *par excellence* for Water-cress, and in some situations which present these features in Trinidad, Water-cress is found in abundance. This salad may however with a little care be fairly well grown in the more confined area of a villa garden provided a suitable place is constructed, and the necessary shade provided. A shallow concrete tank should be provided about ten to twelve inches in depth the lower portion should be filled with broken stones gradually decreasing in size upwards, and the whole drainage should be about six inches in thickness. On the surface of this should be placed two inches of rough sand, and again on the immediate surface two inches of clean loam. When the filling of the tank is complete, turn on a supply of water, filling it to the brim, and after letting it soak for a few days, run off the water and subsequently maintain a constant running supply. The plants may now be put in as cuttings at about four or five inches apart when they will soon fill all the available space. Unless the tank is fairly well shaded however *Oscillaria* and other fresh water Algæ take possession of the water and hinder growth. Such a shade may be given by constructing a light frame work covered with palm leaves, but it is generally more economical to provide a growing shade in the form of a vine or creeper of some kind. After a time when the vigour of the Cress diminishes, the loam, sand, and drainage should be removed, the drainage washed and returned, but fresh loam and sand should be provided. Great care should be taken that only clean water is used, and that no contamination of any kind should enter the tank in which the Cress is grown, as, being eaten in an uncooked state, even the slightest contamination of any kind is highly dangerous to health. In preparation for the table also Cress should always be dipped for a few seconds in strong salt and water and afterwards washed in fresh, as by this means many objectionable organisms can be removed.

175.—"ARTICHOKES."

The above name is one commonly applied in England to two distinct plants, one called the "Globe Artichoke" or *Cynara cardunculus L.*, and the other the "Jerusalem Artichoke" or *Helianthus tuberosus; L.* The Globe Artichoke is shewn by De Candolle, p. 42 of "Origin of cultivated plants" to be a native of Mediterranean countries, but has during the present century become so firmly naturalized in Brazil and Chili as to have become a hindrance to travellers. The Jerusalem Artichoke on the other hand is shewn to be a native of North America and is capable of bearing any amount of cold. Reasoning on the basis of climate it would certainly appear likely that the plant which comes from the warm region of the Mediterranean would be more amenable to cultivation in the West Indies than one coming from North America. As a matter of fact however the "Jerusalem Artichoke" is a comparatively easy plant to grow, while the "Globe Artichoke" is very difficult, and can only be grown at considerable elevations and seldom appears in our local markets. Temperature has probably in this, as in many other cases, less to do with the result, than humidity; for it is found that the "Globe Artichoke" suffers most in damp weather, while the "Jerusalem Artichoke" can stand moisture with impunity, and can also stand a season of drought without being seriously affected. The common names applied to the "Jerusalem Artichoke" in various countries are given by Messrs. Vilmorin-Andrieux in their famous work on the "Vegetable Garden" as follows:—*French*, Topinambour; *German*, Erdapfel; *Flemish*, Aarpeer; *Danish*, Jordskokken; *Italian*, Girasole del Canada, Tartufoli; *Spanish*, Namara; *Portuguese*, Topinambor; *English*, Jerusalem Artichoke. De Candolle further states: "The French name Topinambour comes apparently from some real or supposed Indian name. The common English name is a corruption of the Italian *girasole*, sunflower, combined with an allusion to the artichoke flavour of the root."

M.M. Vilmorin–Andreiux gives the following: "stem erect, very stout, sometimes over $6\frac{1}{2}$ feet high" and it is known that in good ground in Europe that they often reach one or two feet more than the height given. Here however in Trinidad the variety generally cultivated seldom reach more than three and is often but two feet in height. The tubers are small and much worted or divided, and there is consequently great loss in preparing them for the table. In Europe the tubers are colored somewhat (*voilet-red, Vilmorin*) with a reddish

or dull flesh tinge, but here on the contrary they become nearly white, and when ripe are very small in size. So much do they differ from the English varieties that I at one time was of opinion that it might be a different species to that cultivated in the old world and to test this I procured sets for the season of 1895, the tubers of which when planted, presented a vastly different appearance to our own. Grown side by side with our common variety the result has been interesting, for the imported tubers produced stems one-third higher than these, with tubers double the size, much more tender, and of a better flavour and moreover, like our own, the tuber proved to be without a particle of colour. The flowers and leaves are also on an average about $\frac{1}{3}$ larger than the Trinidad kind but do not otherwise vary sufficiently to make even a varietal distinction. Subsequent cultivation will of course shew whether the imported kind will, in a season or two, put on the type of growth common to our local variety, or whether it will continue to maintain the slight difference in size which is now the only apparent distinction other than that of superior quality in the imported variety. This much however is certain (viz.) that from imported sets, we can in one planting obtain larger and better flavoured tubers than from the kind which is usually grown in Trinidad. The "Jerusalem Artichoke" has its French name of "Topinambour" monopolized in Trinidad by another entirely different plant, viz.: *Calathea Allouya, Lindl.*, which belongs to the order *Scitamineæ*, while both the Globe and Jerusalem Artichokes belong to the *Compositæ*, which is another curious illustration of the unreliability of popular plant names, which are so much insisted on locally in Trinidad. The Jerusalem Artichoke is much used in Trinidad as one of the ingredients for making a very palatable kind of white soup, known as Palestine soup.

The plant as I have before mentioned is quite an easy plant to cultivate; all that it requires, is to be grown in a friable soil, fairly fertile, and the sets placed some 15 or 18 inches apart. The tubers should be taken after the plants have flowered, but before they give signs of withering, as the roots are apt to become stringy if left too long before digging. It is one of the most useful tropical vegetables we have, as it may be had at various seasons, simply by varying the time of planting the tubers.

176.—ROSES.

In No. 2 vol. 2 p. 45 I called attention in a short article to Rose Culture, but the following on the same subject by my friend and former colleague in Jamaica Mr. Nock, now of Ceylon; is so clear and to the point and so much in accord with my own experience that I give it in full as of the highest value to cultivators of the Rose in the West Indies, the conditions of climate in Ceylon being similar if not identical with those existing in Trinidad.

ROSES

THEIR CULTIVATION IN CEYLON:

By W. Nock, Superintendent of Hakgala Gardens, Nuwara Eliya.

Site.—Although roses will grow in almost any situation they can never be grown to perfection, or indeed to give satisfaction, unless the site is carefully chosen. The rose delights in an open sunny situation and one that has an Eastern or Southern aspect is the best, provided it is sheltered from strong winds. Under the shade of tall trees and lofty buildings they never thrive and these conditions should be avoided as much as possible. Even in small gardens it is best to keep all rose plants together; they can then, without injury to anything else, receive the treatment most advantageous to them at any time of the year. As for instance should diseases attack them the remedies can be applied more easily and with greater effect than if they were scattered all over the garden. And again with manure if they are planted among other plants they scarcely ever receive the full benefit, as the roots of the surrounding plants will be sure to run in and rob them before they have time to take up anything like the quantity they need for the development of strong healthy shoots and foliage. The robbery that is going on under the soil among plants is very much greater than most people suppose. I know from actual experience that a hole, 18 inches in diameter and one foot deep, which was got out at a distance of 12 feet from the trunk of a tree, and filled in again with a mixture of manure and good soil, was in six weeks just one mass of hungry roots and the rose plant that was planted in it, not being able to hold its own among them, was quite sickly and dying. This of course is an extreme case, as the roots happened to come from an Acacia tree, but the roots of all trees do some damage and it is well, especially in the case of roses, to be on the look out for them and keep them at a respectable distance.

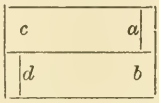
The drip from large trees will also keep roses from thriving and injure the flowers.

Soil.—The soil that roses most delight in is a rather strong rich loam, the deeper the better, and it should be quite free from stagnant moisture. This refers to roses generally, but roses on their own roots will thrive in much lighter soil. They will not flourish or last long in heavy clays or in soil that is of a light sandy or gravelly nature. Of course these soils can be manured and prepared so as to suit the plants, as will be explained a little further on, but where the ground is so bad as not to admit of improvement in this way, it must be removed altogether and replaced with that of a proper description. Good drainage under all conditions of soil is of the utmost importance, for roses will never flourish long in a soil that is naturally wet.

Manure.—For general purposes a mixture of the following will form as good a manure as can be desired. Pigs' dung, cow-dung, burnt earth or wood ashes and *old* night-soil in about equal parts and to this should be added a good sprinkling of crushed bones and quick lime, and all thoroughly mixed together. It is important that the dung, of whatever description, should be well decayed and the night-soil should be very old. For light soils strong loam should be used with cow-dung and night-soil. For heavy soils burnt earth, sand and leaf-mould should be used freely in addition to the compost mentioned above. It would be well too in very heavy soils of a cold nature to use good stable manure in the place of cow-dung.

Preparation of the Ground.—Thorough drainage is the first thing to be considered, and this should be effected by opening drains 4 feet deep and 10 to 15 feet apart and laying down draining tiles along the bottom, allowing a good fall so that the water drained off may run away freely. If tiles are not to be had, a fairly good drain can be made by placing nine inches to a foot of rubble stones in the bottom, and on these should be placed small twigs to prevent the drainage from getting choked. In filling up the drain the roughest material should be thrown in first.

The whole of the land should now be stirred to a depth of two feet, or two and a half feet if the nature of the soil will allow. This should be carried out in the following manner :—

If the piece of land to be trenched is large, it should be divided into two parts thus 

and a trench 2½ feet wide and 2 feet or 2½ feet deep cut as the case will allow. Dig out the whole length across the patch marked *a*, and the soil from it is to be carried and placed along the end marked *b*. Then mark off a space 2 feet wide next to the open trench and throw in this the first 2 or 3 inches of weeds and litter, on top of which turn the next foot of soil and so on until the second trench is as deep as the first, mixing in the manure as the work proceeds, and continue trench after trench until the whole of *a* is finished down to *c*. Then take out another trench 2½ feet wide along the end of *d* to fill up the trench along *c*. Continue the trenching as before up to *b* where the soil from *a* will be found ready to fill in the last trench. For narrow strips of land the trench may be got out along the whole end and wheeled to the opposite end to fill up the last trench. The first trench should always be six inches wider than the others to allow for the slope necessary to prevent the soil from falling back into the trenches.

Where the sub-soil is poor and bad it will not be advisable to turn the lower part of the trench uppermost, but it should be loosened up to a good depth and enriched with manure. It is a good plan whether the sub-soil be bad or not to loosen the bottom of the trench with a digging fork, as it not only improves the soil, but allows the roots to descend deeper and they are then less likely to suffer in dry seasons.

Should the soil be gravelly or very sandy, it will be necessary to remove it to a depth of 20 inches—where the plants are to be grown—and replace it with proper soil which should consist of strong loam enriched with manure. If this is not done the plants are almost sure to suffer from Red Spider during dry weather.

Laying out of the Ground.—The simplest forms of beds I consider are the best adopted for roses and they always show up best when the beds or borders are cut out in turf or have turf verges round them. However, the shape of the beds and whether the paths should be turf or gravel may be left to the taste of the individual interested, but whatever shape they are they should not exceed 6 feet in diameter, in order that the plants may be attended to without treading on the ground.

Planting.—Roses in Ceylon can be planted at almost any time in showery weather, but it is best to do so during the period of rest or before they start into fresh growth. Strong well rooted plants should be selected and the work must be performed with care. A sufficiently large hole must be taken out to allow room for the roots to be spread out naturally within 4 or 5 inches of the surface. They should never be packed together. The collar of the plant, if on its own roots, may be about 2 inches under the surface, if otherwise it should be just level with the ground. A few hand-fulls of leaf-mould thrown in among the roots will be of great benefit in helping the plants to root quickly in the new soil. The other soil should be filled in evenly and firmly, then water to settle the soil about the roots.

For dwarf specimen plants 3 feet apart is a good distance, but if the plants are required to be pegged down to cover the whole surface of a bed they may be planted as close as 2 feet, or even 18 inches. Should dry hot weather follow the

planting they must be shaded and watered until they have made fresh roots, care must, however, be taken not to over-water as it will cause the soil to become sour and the plants will not grow freely.

Pruning.—It may be taken as a general rule that the weaker the growth the closer the pruning required. The first thing to be done is to cut clean out all weak, pithy, and ungainly shoots, selecting ripe, strong well-formed wood to remain to form the bush, these shoots should be cut back, the weakest to 2 or 3 eyes and the strongest to 6 or 12 according to their strength and position. These remarks apply to hybrid perpetuals, bourbons and most of the teas. The creeping roses such as Maréchal Neil, Lamarque and Celina Forestier require but little pruning beyond thinning out old and weak wood and shortening back the long shoots about one-third of their length. They thrive best and produce more blooms when allowed to ramble about at will, Maréchal Neil especially flourishes under these conditions.

Attention during the Growing Season.—In windy weather the plants must be securely and neatly staked. A good rule with regard to the size of the stake is that it should not much exceed the diameter of the shoot it supports, and this should be so put in as to be as little seen as possible. The beds must be kept free from weeds and the soil stirred occasionally and watered in dry weather. Liquid manure may be applied freely after the flower buds have begun to form, but it should always be given when the plants are dry. It is better to use it too weak than too strong and it should always be free from sediment as this cakes on the soil and looks unsightly and also prevents the air from getting into the soil. By applying it when the plants are dry they take it up at once and there is no waste; but if it is poured on when the plants are already wet—as is very often the case, it more frequently does harm than good.

For hot dry soils liquid manure from cow-dung is perhaps the best and that from horse-dung for cold damp soils. When cow-dung is used boiling water should be poured on it first and then add sufficient cold water to make it weak. It should be about the colour of pale-ale. If guano is used 1 oz. to a gallon of water is quite strong enough, stir the liquid well up over night and apply it the next day when settled. Where worms are troublesome soot water is very useful and beneficial.

In very dry weather the beds should be mulched with two or three inches deep of half rotted manure. This will keep them cool and save a lot of watering. A little soil spread over it will prevent the manure from being unsightly. As the blooms fall away the flower stalks should be cut back to the first bud and the leaves may be kept bright and clean by an occasional syringing. When the young shoots are too crowded the weaker ones should be cut out and if particularly fine blooms are desired the flower buds must also be thinned out.

Attention during the resting period will consist of the pruning and manuring. A liberal dressing of manure may now be given, which should be well forked in among the roots as well as the mulching given during the growing period. Any plants that have grown too much to wood can now be root pruned, which is easily performed by exposing the roots and shortening back one or two of the strongest. This practice is best done gradually so as not to give too sudden a check to the plant. I may here mention that plants that have thrown up long, straggling, naked shoots without flowering may often be brought to blossom by pegging down the shoot to within a few inches of the ground. This causes the dormant buds to start into growth, which, when 6 or 8 inches long generally produce flowers.

Injurious Insects and Diseases.—Roses are specially subjected to injury from Aphides and Mildew. The first must be watched for and can easily be destroyed when it first makes its appearance by syringing the infected shoots with tobacco water in the evening and with pure water next morning.

Mildew is much more difficult to deal with and when once it makes its appearance it is not easily destroyed. Sulphur is the best known remedy, but it is best to prevent its attacks by occasionally dusting the soil and plants with flowers of Sulphur, and to endeavour to keep the plants in as healthy a state as possible. Caterpillars, beetles, grubs, the saw-fly, and the larvæ of several moths are very troublesome and destructive at times. These must be destroyed by careful hand-picking which is the only effectual remedy I know of. Red Spider is sometimes very injurious, but this generally occurs when the plants are

too dry and water should, therefore, be freely syringed among the foliage. Soot-water perfectly clean and tepid, daily syringed over the plants, taking care to wet every leaf and shoot, is a good remedy.

Propagating by Budding.--This is not often required in Ceylon, as most roses do best on their own roots, but where standards are desired or where a particular sort is difficult to strike from cutting and also in the case of weak growing varieties—which may be budded on strong growing kinds—this mode of propagation might be adopted. The operation requires to be performed as neatly and quickly as possible, a very sharp knife is indispensible and the other requisites are a water-pan half full of water, to put the seions in, and coarse worsted, Cuba bast, or any such tying materials.

Any of the strong free growing roses that have taken well to the locality may be used for stocks in preference to either the dog-rose or Manetti. The former does not like the country and only exists for a time, and the Manetti is too apt to give trouble in throwing up suckers. It is a common thing too for it to grow up unnoticed and take the place of the rose budded on it and the owner wonders why it will not flower, or if it does flower he is disgusted to find it only a small single pink flower and not at all the blossom he hoped for.

The shoot to be operated on should be in a healthy growing state, of the current year's growth as also should the shoot from which the buds are to be taken. Early in the morning, before 8 o'clock or after four in the afternoon in showery weather, is the best time for budding. The shoots containing the buds having been taken and placed in the water-pot, proceed to the stock and rub off the prickles from the shoot, which is to receive the bud, as close down to the stem as convenient. Then make a bold cut of about an inch long right through the bark down to the wood, but not deeper, at the upper end make a cross cut, so that the incision will be in the form of the letter *T*. Now take the bevelled end of the budding knife, and run it up and down the incision to raise the bark on either side. It is now ready for the bud which is best taken from the middle of a shoot. Cut off the leaf, leaving half an inch or so of the leaf stalk, then cut out the bud in the form of a shield, commencing half an inch behind it and cutting upwards almost level, but slightly deeper just under the bud and coming out half an inch above it. If this cut is made well there will be but very little wood in the piece taken off. This should be removed (unless it is very succulent when it may remain) by taking hold of it with the thumb-nail and the point of the knife and giving it a sharp twist. Care must, however be taken not to pull out the bud with it. This part of the work requires a little experience and may be practised on any common shoot beforehand. Next insert the bud in the *T* incision, pushing it under with the handle of the knife. The top part of the bark containing the bud should be cut square so as to abut against the bark of the stock.

It should now be carefully and closely, but not tightly, tied with worsted or bast commencing at the bottom. If the weather is likely to be hot, it will be necessary to give shade, but it will not be required if the work is performed during showery weather. A good budder will complete the operation well and neatly in two minutes. The longer the time over it, the less the chance of success. If all goes on well, the ties may be loosened in three weeks or a month, and after the lapse of another 3 or 4 weeks may be removed altogether.

Cuttings may be put in at almost any time, but the best time is during long spells of dull weather. Shoots that can be taken off with a heel (that is a small slice or swelling of the old wood taken off with it) are undoubtedly the best and safest. They should be cut to about nine inches long and the lower end cut clean with a sharp knife. If there is not enough shoots with a heel to be had, cuttings can be made from the other shoots, cut up into same lengths rejecting the top parts, for they rarely grow into good plants. The lower ends of the pieces selected should be cut clean across immediately underneath a joint, and if possible the two top leaves should be left entire on both sorts of cuttings.

They will root best in soil composed of about one-third leaf-mould, and the other two-thirds good sandy loam. It is necessary to insert them very firmly in the soil with about 3 eyes above ground. They may be 2 inches apart in the row, and the rows 9 inches apart. Shade well as soon as they are planted, and sprinkle them with clean water morning and evening for a fortnight or three weeks, then a little of the shade may be taken off. The soil must be kept moist, but not wet, and light and air should be gradually given as the cuttings are able

to bear it. The work of preparing and putting in the cuttings should, like budding be done as quickly as possible.

Selection of Varieties.—Hybrid Perpetuals, which perhaps are the most charming, will not, unfortunately, flower satisfactorily in the low country, and I would not advise anyone to plant them much under 2,500 feet elevation. The Teas, Bourbons, and Noisettes are the kinds most likely to succeed at low elevation. I will, therefore, give separate lists to be selected from, for elevations below and above 2,500 feet. The varieties named can be obtained from any one of the leading English rose nurseries, and if they are sent out during their resting period, they will travel very well in an ordinary dry packing case.

For elevation below 2,500 feet :—

Teas :

Adam ; rich, rosy salmon
Alba Rosea ; white, centre rose
Amazone ; deep yellow
Anna Oliver ; flesh coloured rose
Belle Lyonnaise ; deep canary-yellow, changing to white
Catherine Mermet ; flesh colour
Cheshunt Hybrid ; purplish-maroon
Devoniensis ; creamy-white
Gloire de Bordeaux ; pink, centres crimson
Gloire de Dijon ; yellow, buff, orange and shaded salmon
Goubault ; bright rose
Henry Bennet ; yellow, outer petals pink
Homer ; blush rose and salmon
Isabella Sprunt ; sulphur-yellow
Jean Ducher ; salmon yellow
Madame Bravy ; cream
Madame Camille ; salmon pink
Madame Ducher ; clear lemon
Madame Falcot ; rich saffron-yellow
Madame Margottin ; beautiful dark citron-yellow
Madame Villermoz ; white, centre fawn and salmon
Maréchal Niel ; beautiful deep yellow
Madame Levet ; yellow, outer petals tinged with violet
Marie Von Houtte ; white, tinted with yellow
Niphetos ; white, centres pale yellow
Rubens ; white, shaded with rose
Safrano ; coppery red
Souvenir de Paul Neron ; salmon yellow, edged with rose

Noisettes :

Céline Forestier ; pale yellow, deeper centres
Cloth of Gold ; creamy white, centres yellow
Lamarque ; white, centres deep straw colour
Lamarque Jaune ; golden yellow
Madame Caroline Kuster ; pale yellow with deeper centres
Solfaterre ; creamy white, centres bright suphur
Rêve d'Or ; deep yellow, sometimes coppery yellow
Triomphe de Rennes ; canary, cream edges

Bourbon perpetual :

Baronne de Maynard ; beautiful pure white
Julius Cæsar ; dark cerise-rose
Lord Palmerston ; cherry-red
Revd. H. Dombrain ; carmine

Bourbon :

Apoline ; light pink
Caroline Riquet ; pure white, centres blush
Empress Eugénie ; rosy-blush, purple edges
Mrs. Bosanquet ; white, centres delicate flesh
Souvenir de Malmaison ; flesh colour
Victor Emmanuel ; purple and purplish maroon shade

China :

Camellia Blanc ; white
Clara Sylvian ; pure white
Meillez ; pale lemon, changing to white
Virginale ; flesh colour
Viridiflora ; green (this is only a curiosity).

All the forgoing will grow above 2,500 feet elevation and to these may be added any of the following hybrid perpetuals :—

Hybrid perpetual :

Abel Grand ; rosy-blush
Alfred Colomb ; bright fiery red
Anna Alexieff ; rose-tinted with pink
Annie Laxton ; deep rose, flushed with cherry-crimson
Baron Adolphe de Rothschild ; fiery red
Baron Rothschild ; brilliant crimson
Beauty of Waltham ; rosy crimson
Black Prince ; dark crimson, shaded with black
Boule de Neige ; pure white
Camille Bernardin ; bright red
Captain Christy ; delicate flesh-colour
Centifolia rosea ; bright pink
Charles Lefebvre ; bright crimson with purplish centre
Colonel de Rougemont ; pale rose shaded with carmine
Coquette de Alpes ; white, centre shaded with carmine
Docteur Andry ; dark bright red
Duc de Rohan ; red, shaded with vermillion
Duke of Edinburgh : brilliant scarlet crimson
Dupuy Jamain ; brilliant cerise
Edward Morren ; bright cherry
Eugène Appert ; scarlet and crimson shaded
Firebrand ; fiery red
Fisher Holmes ; magnificent reddish scarlet
François Michélon ; deep rose, reverse of petal silvery
Géant des Batailles ; crimson, shaded purple
General Jacqueminot ; brilliant red
Gloire de Ducher ; purple illuminated with crimson and scarlet
Glory of Waltham ; very large and double and sweet
Jean Cherpin ; velvety purple, shaded
John Hopper ; lilac-rose, centres rosy crimson
Jules Margottin ; bright cherry colour
La France ; beautiful pale peach
Lady Suffield ; purplish crimson
Lord Macaulay ; rich scarlet-crimson
Lord Raglan ; scarlet-crimson
Louis Van Houtte ; reddish scarlet and amaranth
Madame Alice Dureau ; clear rose colour
Madame Eugene Verdier ; deep pink
Madame la Baronne de Rothschild ; clear pale rose
Madame Masson ; reddish crimson, changing to violet
Madame Victor Verdier : rich bright cherry colour
Maréchal Vaillant ; purplish red
Maria Baumann ; bright carmine
Marquise de Castellane ; beautiful bright rose
Monsieur Boncenne ; violet crimson
Paul Néron ; dark lilac-rose
Peach Blossom ; delicate peach blossom
Pierre Notting ; blackish red, shaded with violet
Prince Camille de Rohan ; crimson-maroon
Prince of Wales ; pink
Queen Victoria ; white, shaded with pink
Reynolds Hole ; maroon, shaded with crimson
St. George ; crimson, shaded with blackish purple
Sénateur Vaisse ; brilliant red
Souvenir de Dr. Jamain ; bluish violet
Triompe de Paris ; dark velvety crimson

Thomas Mills ; bright crimson
Victor Verdier ; rosy carmine, purplish edges
Xavier Olibo ; velvety black, shaded with amaranth
*Virgil ; clear lavender-pink

Climbing Roses :

Celine Forestier ; pale yellow, deeper centre
Cloth of Gold ; creamy white, centres yellow
Climbing Devoniensis ; creamy white
Desprez à Fleur Jaune ; red, buff, flesh and sulphur
Gloire de Dijon ; yellow, buff, and shaded salmon
Gloire de Bordeaux ; pink, centre crimson
Lamarqe Jaune ; golden yellow
Maréchal Niel ; beautiful deep yellow
Ophirie ; reddish copper, the outer petals rosy
Safrano ; coppery red
Solfaterre ; creamy white
Triomphe de Rennes ; canary, cream edges
White Banksian ; white

Moss Roses :

Alice Leroi ; lilac blush shaded with rose
Baronne de Wassenaer ; bright red
Celina ; deep rosy crimson
White Bath ; paper white.

W. NOCK.

177.—A NEW USE FOR SISAL HEMP.

Inquiries have reached us through the medium of the British Trade Journal for "Sisal Cloth" for the manufacture of Cider Press Cloths. In the old days these cloths used to be manufactured from horse hair. It is probable that similar cloths for oil mill and other presses, may also come into use.

From the encouraging way in which the Sisal Hemp plant has grown since its introduction into Trinidad, and the superiority of its Fibre, it is clear that our planters will do well to steadily persevere in securing the extension of their plantations in view of an increased demand, and not let the demand come and have no supply to give. The depressed state of the market for this product at present will favourably tend in the long run to generate an upward tendency, and new uses are often found for an article while it is cheap, which afterwards lead on to a steady trade in a rising market.

The warning note sounded by us in 1891 when Sir Ambrose Shea's extravagant anticipations and boom was in full force in the Bahamas, is now amply realized, and it is seen that large amounts of money were invested in an industry, which was eminently a very uncertain one, or one, the merits of which had not been fully proved.

The questions asked in the Bulletin for February 1891, stand as plainly intelligible to day, as they did then, as incapable of being

* The colours are taken from Mr. W. Paul's book on "The Rose Garden.'

answered in favour of the Sisal growers prospects ; a fact which is much to be regretted. Sir Ambrose Shea expressed the opinion that Trinidad would not be able to enter the competition, but it has since been fully proved, not only that Sisal can be grown in Trinidad, but that the fibre produced is superior to the produce of the Bahamas, showing that his opinion rested upon no foundation and that he was certainly uninformed of the conditions which existed in this Island. If ever the circumstances arise which will make Sisal Hemp a paying industry in the Bahamas, it may also be relied upon as certain, that it will pay to as large an extent when grown in suitable lands in the Island of Trinidad, which has moreover many advantages not possessed by the Bahama Islands.

Note.—Since the above was written Dr. Morris of Kew has visited the Bahamas and is of opinion that Sisal has a fair future before it there.

178.—NOTES ON MANURING.

The following notes were originally printed in "Garden and Field" a South Australian Publication, under control of the Department for Agriculture of that Colony. They were reprinted by the Editor of the Agricultural Journal of the Cape of Good Hope of August, 1895 :—

NOTES ON MANURING.*

By Professor Laurie, M.A., B.Sc.

(Cape Agricultural Journal.)

Sources of Plant Food.

The elements or substances which plants use in building themselves are derived from the air, the rain, and the soil. From the air and the rain 93 per cent. fully of their total substance is obtained, and the remaining 6 or 7 per cent. is taken up through the agency of the roots from the soil.

Action of the Leaves.

Carbon.—From the air, for example, carbon, which enters into the composition of all plants to the extent of 40 to 48 per cent. of their weight, is obtained through the agency chiefly of the leaves from the carbon dioxide, which is present in very small proportion in the atmosphere. The leaves absorb the carbon dioxide, and in the cells constituting their tissues under the action of sunlight it is decomposed into its two constituent elements, carbon and oxygen. The carbon is retained and used in the elaboration of the various substances of their tissues, and the oxygen is exhaled.

Action of the Roots.

Nitrogen and Mineral Matter.—While this assimilation is going on the roots supply their complement by absorbing through delicate root hairs and otherwise nitrogen as nitrates, mineral matter, and water in a more or less complex solution. The following substances are taken up this way in solution in more or less complex combination :—Nitrogen, phosphoric acid, potash, lime, magnesia, iron, sulphuric acid, soda, chlorine, silica, manganese, with one or more rarer substances in some particular plants.

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*Garden & Field.

Necessary and available Mineral Matter.

The first seven of these substances so extracted from the soil are essential for healthy plant life, and the others are not indispensable. Some of the seven essential substances are in the soil in abundance, but nitrogen, phosphoric acid, and potash, and in some soils lime, are present only in exceedingly small proportion; and accordingly the farmer or gardener who practises frequent cropping has to supply these substances to the soil directly and indirectly to avoid a deficiency of any one of them. A fairly fertile soil may have in it in the first nine inches in depth only about 15 lbs. of nitrogen, 15 lbs. of potash, and 10 lbs. of phosphoric acid per 10,000 lbs. of soil; and of these amounts only a very small proportion may be immediately available as plant food. In an acre of soil to that depth the nitrogen and potash if they could be isolated would weigh about two tons each, and the phosphoric acid about one and a half tons.

When a Soil is Exhausted.

But a soil shows signs of exhaustion long, long before these substances are drawn on in an appreciable proportion to their weight, for only the soluble fraction is available. Ultimate exhaustion of a soil is therefore altogether impossible. When a soil has been temporarily exhausted—and all exhaustion, I will say again, is only temporary—the farmer may if he can afford to wait let his land lie in pasture until the natural agencies always at work have rendered more of the unexhausted reserve available, or he may hasten the action of such agencies by fallowing or repeatedly working the land without cropping. If he cannot wait, or finds it unprofitable to do so, he has to

Resort to Manuring,

either directly by supplying and distributing over the land manures, natural or artificial, or indirectly by growing leguminous and other crops, to be ploughed in, or by purchasing artificial foodstuffs, with the view of carrying more stock, increasing accordingly the size of his manure heap, or enriching the land right away by their droppings.

A Law which Altereth Not.

In the practice of manuring we have to bear in mind that it is one or more of these substances nitrogen, potash, or phosphoric acid, and occasionally lime, which may become deficient, and that a deficiency of any one of them cannot be made up by an excess of another. When anyone of these substances is not available, the land becomes barren, and farmers have, therefore, to endeavour to *maintain the natural balance*. Further, the crop is stunted or unhealthy according as one or more of these indispensable substances becomes scarce, or available in too small proportion.

Farmyard Manure.

Now a general manure such as farmyard manure supplies more or less, according to its quality, of each of these comparatively scarce but all-important substances.

A ton of it contains :—

8 to 16 lbs. of nitrogen,
8 to 17 lbs. of potash, and
4 to 9 lbs. of phosphoric acid,

and, considered with its other recommendations, if it can be readily obtained in quantity, and at moderate cost, there is little need of further dressing with artificial manures, except perhaps a little of the phosphates, in which, as the figures above show, it is relatively weak.

Artificial Manures.

However, it is with artificial manures that we now propose to deal.

Phosphoric Acid.—Scarcity of phosphoric acid can be relieved by using bone dust, bone meal, bone charcoal, mineral superphosphate, dissolved bones, basic slag, or phosphatic guanos, &c.

Nitrogen.—Deficiency of nitrogen can be made up by artificial dressings to the land of nitrate of soda, sulphate of ammonia, blood manure, nitrogenous guanos, &c.

Potash.—Weakness in potash can be avoided by the use of wood ashes, muriate of potash, kainit, &c.

In our South Australian conditions, and with our present prevailing practice it will generally be found that deficiency of phosphates is the greatest weakness in our soils, and that phosphatic manures should first have the attention of farmers.

A Judicious Mixture.

I would not have it understood that I am suggesting the use of phosphates only and always and invariably. On the contrary, judicious mixtures have much to recommend them, and a man cannot expect to get the best results unless he adopts such as occasion demands. There is, however, much to lead me to give phosphatic manures a fair trial first, as from experiments conducted here and elsewhere it has been shown that phosphates alone have often given better results on wheat lands than more expensive mixtures of phosphatic and nitrogenous manures. As bone dust contains from 3 to 4 per cent. of nitrogen it has been found that it can be used by itself for a longer succession of years than superphosphate, but at the same time let it once be recognised that the mixtures of artificial manures is the desirable practice, and that the application of one form —phosphatic, nitrogenous, or potassic—by itself is the exception to be practised only under suitable conditions, and much relatively unprofitable manuring will be avoided.

Value of Bare Fallowing.

Again, our practice of bare fallowing for wheat, which is almost universally practised in the colony, is a means of slightly increasing the relative proportion of nitrogen, because —

1. It promotes nitrification, *i.e.*, it brings about conditions favourable for the activity of the myriads of micro-organisms in the soil, and consequently nitrification is correspondingly rapid.

2. Bare fallowing further is a means of retaining moisture in the land, and consequently a means increasing the absorption of the nitrogen from the air in the form of ammonia or otherwise.

3. Our dry summers and the absence of under-drainage enable us to avoid the loss of nitrogen which occurs in many countries, as nitrates are very soluble and readily go off in water.

Potash, again, is almost invariably much more abundant in most soils than phosphoric acid, and our practice of continuous wheat-growing is also less exhausting of potash than of phosphoric acid, for much of the potash is left on the farm in the straw, while much of the phosphoric acid goes off in the grain. For these reasons the use of phosphates alone give more frequently than might be anticipated very satisfactory results.

Bones.

Bones have been in use as a means of adding phosphoric acid for more than a century. They were first used as half-inch or quarter-inch bones for the purpose of top-dressing pasture, but now they are crushed very much finer, so as to become more readily dissolved and available as plant-food, and applied as bonedust, or bonemeal. They can be had for manurial purposes steamed or unsteamed. Steaming is a means of reducing the percentage of organic matter, which forms about one-third of the composition of bone, and, consequently, of reducing the percentage of nitrogen. At the same time, it is better to have the bones steamed in the process of manufacture of bone dust, because it has been found that the fatty matter present, if not extracted, makes it most difficult to get the dust fine, and also because the fatty matter prevents the agencies of Nature bringing about the decomposition of the bone, and making it available for plant food so readily as in the case of bone dust from steamed bones. Steamed bones further give a bone dust richer in the percentage of phosphate of lime in so far as the organic is mostly away.

Good bone dust should contain about 48 per cent. of phosphate of lime and from 3 to 4 per cent. of nitrogen. However finely it be ground, it will always become slowly available relatively for plants. It is therefore spoken of as a lasting manure, but that quality, as times are now, is a disadvantage, as the farmer has to wait too long for the recovery of his money.

Superphosphate I believe to be the more profitable manure all round, except on soils deficient in lime and on peaty or very light soils under a heavy rainfall.

By superphosphate is meant mineral superphosphate, of course, for bone

superphosphate is relatively expensive, and although it gives better results, the gain is not in proportion to the higher price at which it can be obtained.

If phosphatic manures were used as widely in the colony as they ought to be, and profitably could be used, very little bone superphosphate would in all probability be manufactured as the demand for bone dust for lands for which it was the most suitable would more than meet the supply. Very little mineral superphosphate has yet been used in the colony, and consequently it is much more expensive than it would become were it used more extensively, and imported in large shipments.

Bones are often applied to crops which occupy the land for a number of years, and are generally agreed better for such than superphosphate. For example, lucerne benefits much from heavy dressings of bone dust, say 6 cwt. applied during the winter months, when the lucerne is being cultivated. Pasture lands benefits much also from a good dressing, though it is very doubtful whether pasture, even the best, could be profitably dressed with bone dust in this colony, where live stock fetch prices so exceedingly low, and dairy produce is relatively cheap.

Vines and hops also are generally dressed with bones in preference to superphosphate.

How to use Bone Dust.

Wheat-crops.—Where bone dust is used for a wheat-crop, seeing it becomes so slowly available, the practice of applying it in the spring, when the fallow is having its first scarifying is a good one. Let the bone dust be distributed in front of the scarifier. It is then well worked into the land during the successive workings through the summer and autumn, and in addition to having indirectly benefited the land by its decomposition will be more ready to tell on the crop sown over it. For this purpose a dressing of 2½ cwt. to 3 cwt. will be sufficient per acre. Another good practice is to dress the land that is to carry a fallow crop such as sorghum, to be fed down, with a similar dressing of bone dust. The summer crop will benefit somewhat, though not so much as the succeeding wheat-crop; and as the crop will have been fed down, little of the manurial value of the bone dust will be lost, while much will be available for the winter crop.

For hay it will be found good practice to apply, say, 60 to 90 lbs. of nitrate of soda or sulphate of ammonia when the wheat is sown, in addition to the bone dust applied in spring as above.

On heavy, stiff wheat lands it should be mentioned bone dust takes so exceedingly long to decompose and become soluble that superphosphate is ever found better. Again, in our drier districts if manure be used at all the phosphate should be applied as superphosphate, but the general opinion that in the drier districts, where the average rainfall is under 14 inches or thereabout, it is more profitable to crop the land at longer intervals than to use manure and crop frequently is no doubt well justified. In the hills districts and in districts with a better rainfall the case is different, and bone dust or superphosphate, with or without nitrate of soda or sulphate of ammonia, should certainly have a thorough trial.

On farms where hay is largely grown there is no question but that very extensive artificial manuring will prove profitable, but to get immediate returns it will generally be found that superphosphate is better than bone dust as the phosphatic element in the manure mixture.

179.—THE INTRODUCTION OF AN INTERESTING PALM.

Lodoicea Sechellarum, Lodd.

"*Sea coconut,*" "*Double coconut,*" "*Coco-de-mer.*"

It had long been desired to introduce this interesting plant into the Trinidad Gardens, but until the present year it had not been found practicable to do so. On my visit to the Demerara Gardens in 1894, I found that Mr. Jenman had successfully introduced growing nuts; and that these had germinated in due course, and had produced

their first leaves. Acting on the information obtained, an order was sent to Mauritius during the present year with the result that in October twelve fresh nuts were safely delivered at the Gardens, in growing condition.

Prior to the discovery of the Sechelles Islands in 1743, the home of the palm which bears these nuts was unknown, but the nuts themselves had been frequently found floating upon the Eastern seas; hence the name *Coco-de-mer*. The tree is said to attain to one hundred feet in height, and to take thirty years to produce its first fruit. The leaves are described as being upwards of twenty feet in length and twelve feet in width. It is to be hope therefore that from the seed now introduced, several plants of this most interesting palm may be successfully raised.

The nuts are over a foot in length and as much in width, and weigh some eight to ten pounds. It is stated in some descriptions that from one to three of these nuts are contained in a single fruit which will itself weigh as much as 40 lbs. avoirdupois.

A specimen of the nut shell has recently been presented to the Victoria Institute. In the east, these nuts are converted into various domestic utensils, and drawing room ornaments, the leaves of the palm are made into hats, baskets, cigar cases, &c., and the wood serves many useful purposes.

Those nuts which had already germinated have been planted out in suitable positions in the Royal Botanic Gardens and one is now showing its leaf above ground.

21st March, 1896.

180.—ROBBERY AND MURDER.

In the vegetable kingdom, as in the animal kingdom, there is a regular system of robbery going on, and morality as understood for the animal kingdom is a thing unknown. The strongest and the "fittest" survives at the expense of its weaker brother, and it needs the hand of man to institute a strict harmony of relations between cultivated plants. This cannot however be done except when guided by long experience and study of their requirements. We know well that the "Bois Immortel" or "Madre de Cacao" takes nothing away from the Cacao tree even if their roots intertwine; it is believed to afford nutriment or moisture to the cacao, and certainly affords it protection against the rays of the sun. The assimilation of Free Nitrogen by plants has long exercised the minds of Chemists and Botanists, and it has now been shown that Leguminous plants are,

not only capable of obtaining it for their own use, but are the agents for storing in the soil nitrogen which is valuable as plant food for other trees. The "Bois Immortel" is a Leguminous plant and it probably provides the Cacao growing beneath its shade with a store of nitrogen necessary for vigorous growth, which it could not obtain from any other source, so that if the theory of the *immortel* supplying moisture to the roots of the tree be proved to be without foundation —as without the slightest doubt it easily can—there is left the fact that the "Bois Immortel" is still the "Madre de Cacao" from its preparing and storing for its use an abundant supply of nitrogen.

While there are plants, however, which prepare food for others, there are also those which steal from others.

Who has not witnessed the lamentable failure which usually occurs where attempts at flower or vegetable gardening, are made beneath the shade and within the reach of the roots of large trees. A row of croton (*Codiaeums*) in tubs were once placed along side a walk under the partial shade of an avenue of trees. One, who thought he knew, said, they would do much better if planted out. Large holes were dug, a plentiful supply of manure furnished, and the plants were placed in the ground. The first few months all went well, but it was soon apparent that the operator had calculated without his host, for it could be seen that the plants began to suffer, and on examination it was found that the nice new soil and manure placed in the croton holes had been taken possession of by the roots of the large trees and had actually become a matted mass—to the exclusion of the tender and more delicate roots of the croton, thus practically starving or murdering the latter.

Again the cultivator must not rest content with keeping from beneath the shade of large trees, for the roots of such trees are always on the look out for, and seemingly have the power to find, any store of nutriment which may be placed within reasonable distances. It is surprising sometimes to find to what a distance such roots will go in search of suitable food, and the cultivator who sees the small plants in his little garden dwindling away, had better examine the soil deep down at the edges of his beds to see if robber roots have not entered and taken possession, and, if so, to sever them well back. Robberies of this kind are sure to take place if the large trees are growing in a poor and hungry soil. Cutting beds, though requiring shade, should never be made on the ground beneath large trees, as it is absolutely certain that the giant plant, having possession, will starve the poor and struggling cutting.

Some plants, on the other hand, seem to have a special affinity for one another, and will grow side by side in the happiest manner, and take an equal share of nutriment from any manure that may be applied. This is owing to the fact that the major requirements of such plant from the soil are dissimilar, and it is only such classes of plants that may be placed together. We shall find many instances of this, if we enter virgin forest and note the class of trees growing together. In the Pine Forests of North America, but few seedlings trees of the same kind are to be found and these are sure to be poor and weak. The reason is, that the ground is already taken up by their parents and the nutriment in great part abstracted from the soil, besides which the young plants are deprived by their seniors of the necessary amount of light and shade they require. Plants in such situations, are also attacked by numerous diseases, especially those caused by fungi, which, after first living upon the decaying matter falling from the large trees, become parasitic, and kill or murder the smaller plants. If, however, the seeds from the Pine Forests are carried into sections on which oak, beech, birch or any other hard wood grows, they will succeed rapidly and well, and *vice versa*, and moreover if the forest of pine is cut, the under wood or natural growth which follows is rarely of the same character as that which previously stood there, but of an exactly opposite character. The oak and birch succeeding the pine and spruce, and the pine and spruce succeeding the oak and birch, thus giving one of the clearest possible lessons on the *absolute necessity for alternation of crops.*

Robbery and murder are also committed by plants in ways other than by the system of starvation. The "Matapalo" (local name for almost any kind of large climbing plant of the *genera* Ficus, Clusia, &c.) wraps itself round its victim, and effectually throttles and strangles it, by the exclusion of air, and by the centripetal pressure which it exerts.

The plants of the Order, *Loranthacea*, are also familiar pirates or robbers in West Indian fields.

These are most destructive *parasites* and fasten upon and abstract the juices of plants in a most destructive way, in fact they are the most destructive that we have to contend with in the West Indies. They specially affect Orange trees and Casuarinas, &c., and besides, attack very many of the indigenous forest trees. These are the real and true parasitic growths that do real harm to cultivated trees in the open, and they should at once be removed as soon as seen in all culti-

vated grounds. A line of distinction should however be drawn between this class of plants and the harmless epiphytes which are so numerous on our garden and pasture tress. In fact the one is the bold and active robber, and the other a harmless citizen, living upon the food supplied by air and water.

Robbery is also effected by the very numerous parasitic Fungi. These were little known only a few years ago and can only be properly observed under high powers of the microscope, and without such aid it can hardly be understood what seriously destructive agents they can become even to the largest trees of the Forest. If we take a section of wood from a tree thus attacked, we find first, that portions are discolored, and if one uses a still higher power, we shall find the interior tissue and cells of the wood permeated by threads of mycelium which, passing through the walls, disintegrate and disolve all the matter with which they come in contact.

The result of this interior attack is shown macroscopically by the death of a tree, or of those portions of it which are primarily affected. In some cases, however, it is possible for the vital force of the plant to overcome the attack of the fungus, and to stay its ravages, but it is easily seen that trees without sufficient nutriment (that is to say), planted in poor soil and without a sufficient supply of nutritive matter in the form of manure, or weakened by any special cause will most readily succumb to the attack of such insidious diseases. In fact, through want of vitality or constitutional weakness, they are easily robbed and murdered, and the only external sign of the attack may perhaps be, the development at a late period on the cuticle or bark, of the ultimate form of the fungus, or that which developes the reproductive bodies or spores, which again become ready in this position to seize upon and destroy any tree to which they may gain access, and which is in condition to form for them a suitable home in which to run their lives course and enable them again to commit in their own way Robbery and Murder.

181.—CIRCULAR NOTES.

Botanical Department, Trinidad.—Circular Note No. 30.

Sugar Cane Seeds.

As I have few opportunities of collecting personally, I should be thankful to any planter who would kindly send me Sugar Cane Seed for the purpose of cultivation.

The seed should be gathered on a dry day from those "Arrows" on which the seed is *fully ripe*, which condition may be known by its beginning to fall from the plume.

This should be carefully noticed as the fertile seed, being heavier than the unfertilized awns will fall first.

It is therefore useless to gather seed from those arrows which have already shed the greater portion of their down.

The seed should be put in a dry bag and at once forwarded.

I appeal to planters to assist me in this effort as the value of seedling canes has now been fully proved, and we desire to raise others from home-grown seed.

The bags should be labelled with the name of the cane from which it was gathered.

J. H. HART.

16th December, 1895.

182.—WATER MEASURES AND RAINFALL.

(Cape Agricultural Journal.)

In connection with various operations in practical farming, conservation of water, rainfall and irrigation, the following measures and quantities may be found useful.

Water Measure.

1 Imperial gallon of pure water weighs 10 lbs.
1 American or colonial gallon weighs $8\frac{1}{3}$ lbs.
1 Imperial gallon contains 277·274 cubic inches.
1 American or colonial gallon 231 cubic inches.
5 Imperial gallons equal 6 Cape gallons.
1 cubic foot contains nearly $6\frac{1}{4}$ Imperial gallons (6·23).
1 cubic foot of water weighs $62\frac{1}{4}$ lbs. (62·212).
1 cubic yard contains $168\frac{3}{4}$ gallons.
1 Imperial pint of water weighs $1\frac{1}{4}$ lbs.
1 Imperial pint contains 20 fluid ounces.
6 wine bottles are reckoned to contain one gallon of water or $26\frac{3}{4}$ ounces each.

Rainfall and Irrigation.

1 inch of rain is 144 cubic inches to a square foot.
1 ,, 1,296 ,, or $4\frac{1}{2}$ gallons to square yard.
1 ,, 22,622 gallons to acre, 4,840 square yards.
1 ,, 113 tons of 2,000 lbs. to the acre.
1 ,, $14\frac{1}{2}$ million gallons to square mile.

By an inch of rain is understood as much rain as would form a sheet of water one inch deep over the surface of the ground, if none of it soaked into the soil or ran off.

An inch of rain falling on a roof will be after the rate of a little more than half a gallon to the square foot.

As the slope of the roof makes no difference, a house roof will, when an inch of rain falls, collect a half gallon of water for every square foot of area the house stands upon.

So if a house is 40 feet long and 30 feet wide, the catchment area will be 1,200 square feet, and an inch of rain will supply to a cistern 600 gallons, allowing some 15 gallons for waste and evaporation.

If there is 20 inches of rain-fall during the year, then with proper spouting and cistern room, the above mentioned roof or area would furnish during the year 12,000 gallons of water.

An inch of rain over an acre of 4,840 square yards being 22,622 gallons to the acre, it is a matter of some interest to get at the approximate quantity required for irrigating.

As I find that usually, even in a dry season, after 2 inches of rain have fallen, the land can be ploughed, I have suggested that 50,000 (fifty thousand) gallons be accepted as an estimate, the quantity required for irrigating an acre of land once.

Of course more or less water will be required according to the nature or staple of the soil, its dryness and powers of absorption. But still it is well to have a definite or approximate standard of measurement as to the quantity of water required, to be delivered by a pipe or furrow, or, it may be pumped for irrigation.

In Spain the regulation quantity of water for one irrigation is $2\frac{3}{4}$ inches. This would be 52,210 gallons per acre.

It has been found in practice that one good watering is much better than two or three light ones. For unless the water soaks some way into the ground, it does not enable the crop to feed on the plant food in the soil. If only a little below the surface is kept moist, the roots of the plants will be encouraged to grow near the surface and suffer from the heat and drought, instead of penetrating deep into the soil and sub-soil.

Measuring the delivery of water as to quantity supplied in a given time, has been a question of some consideration, enquiry, and experiment.

The fact or difficulty to be dealt with is that the quantity of water delivered over a weir or through a pipe or any other kind of aperture *constantly* varies with depth or pressure of the head of water whence it is derived.

For instance, the quantity of water which is delivered through a four-inch pipe with *two* feet of water above the orifice will be 354 gallons per minute while the quantity delivered through the same pipe with a head of *one* foot of water would be only 250 gallons per minute, being a difference of 1,240 gallons per hour.

So the problem to be solved was to invent or arrange some plan by which the water should always be delivered under the same pressure which would be secured if always the same *head* or depth could be maintained.

In Italy this water measurer is called a *module*. The principle of which is, that a stone trough is filled from the canal, river or spring, in which trough or module the water is always kept at one state of fulness or level, and so maintains the same pressure and consequently delivers exactly the same quantity of water at all times and in perpetuity.

In the United States of America the law of water delivery provides for the construction of a "module."

Water is sold by the *square inch*, that is the quantity which will be delivered by each square inch of the aperture through which the water flows. An orifice one foot long and two inches high, thus delivering 24 inches.

The law provides that "water sold by the inch by any individual or corporation shall be measured as follows, to wit, every inch shall be considered equal to an inch square delivery orifice under a five-inch pressure, and the five-inch pressure shall be from the top of the orifice of the box (module) to the surface of the water." This will give a constant pressure of four inches.

A module thus constructed, and with this pressure, will deliver through *every square inch* of the orifice $7\frac{1}{2}$ gallons (Imperial) every minute, and 450 gallons per hour.

A four-inch pipe under the same pressure will deliver 94 gallons per minute.

183.—A JAMAICA DRIFT FRUIT.

In *Nature* of November 21st 1895, Dr. D. Morris, Assistant Director of the Royal Gardens, Kew, discusses the origin of a drift

fruit found on the shores of Jamaica, the history of which is as follows :—Dr. Morris when in charge of the Jamaica Botanical Department made a collection of drift fruit and seeds washed ashore in that Island. Among these was a curious fruit or seed which could not be identified. The writer, then employed in the Jamaica service, assisted Mr. Morris in the selection and packing of the set for Kew, and in doing so happened to notice the seed in question. In January 1889, an article appeared in *Nature* from Dr. Morris who in the end after quoting all known references, stated that "we are still without information as to the origin of the fruit or the plant bearing it."

Having a distinct remembrance of the fruit, the writer at once commenced a search among the specimens and papers left by his predecessors, and was fortunate enough to find among Crüger's drawings a most complete one of *Saccoglottis amazonica*, in the details of which he at once recognised the familiar likeness of the Jamaica drift fruit, and in writing to Dr. Morris, in March, 1889, these drawings were sent on to Kew.

These have now been thoroughly examined, and as a result, they have solved the mystery of the Jamaica drift fruit which is now shewn to be the seed of *Saccoglottis amazonica*, a tree which was found by Crüger, when travelling in the Iröis District many years ago. The tree is also found at Teffe or Egas on the right bank of the middle Amazon, where it was collected by Martius and others. From these points the fruits drift to the shores of several West Indian Islands and it has been found also to have crossed the North Atlantic, and to have found a resting place on different points on the shores of Western Europe.

Dr. Morris in his recent article lays great stress upon the value of field drawings and dissections, which he declares to be of the greatest value in the elucidation of questions of a character similar to that surrounding the origin of the "Jamaica drift seed."

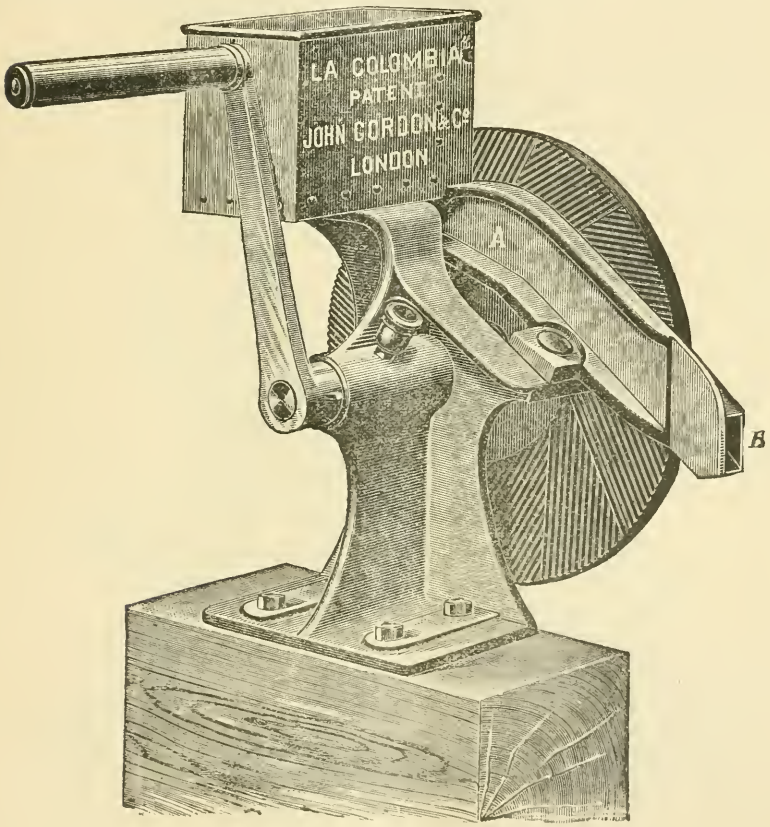
10th March, 1895.

Note.—Since the above was written several trees have been discovered in the district where Crüger collected, and further specimens have been secured which will form the subject of a future note.

184.—GORDON'S PATENT COFFEE PULPING MACHINES.

THE "COLUMBIA" AND THE "INDIA."

BOTH these Pulpers have been specially designed to meet the requirements of Planters of very small estates and they will be found to be very strong, simple and serviceable machines. The ripe Coffee Cherries and feed water should be delivered into the water-box which is formed in the hopper, so that the water may float the coffee over the division into the machine; the supply is regulated by the feed water.

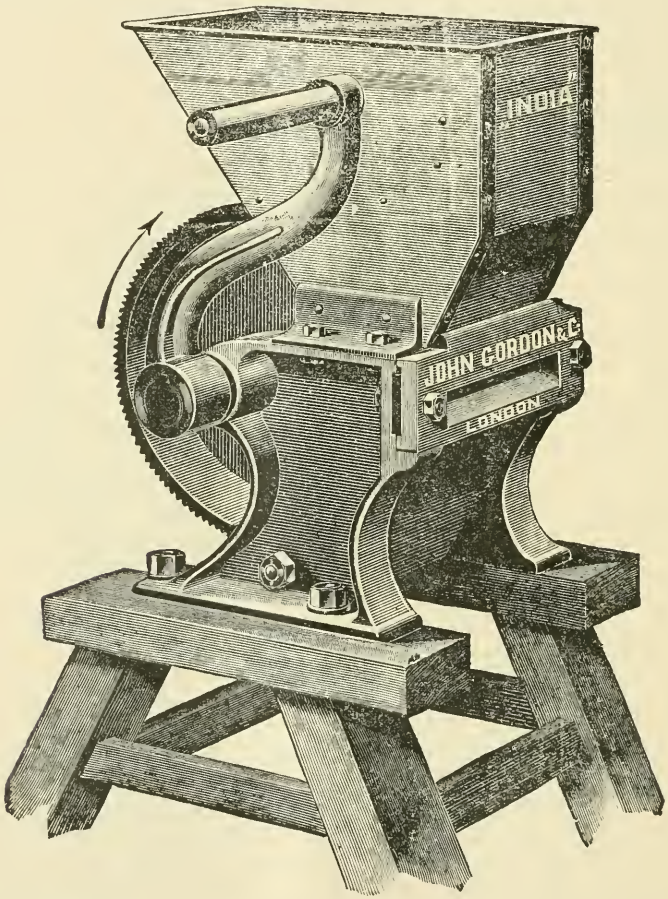


The "Columbia" consists of a grooved disc of hard cast-iron fixed to a shaft which runs in a long bearing mounted on a suitable standard which also carries the bar 'A' and a hopper. The bar 'A' has a channel on its side along which the coffee passes while being pulped; the pulp and skins are dragged down past the bar by the

revolving disc and the cleaned beans are discharged at B. The bar should be kept as close to the disc as possible but without touching it.

The hopper is fitted with a division which forms a water-box for retaining any stones, &c., that may be among the coffee and preventing them from passing to the disc and damaging it.

The bearing is specially long to minimise wear and is fitted with a brass syphon lubricator which should be kept supplied with oil. This machine weighs 82 lbs. and when packed in a case 130 lbs. Price packed for shipment £10.



The "India" consists of an iron Cylinder covered with a punched Copper sheet mounted on a spindle running in two side-frames which carry the hopper and the pulping bar. The hopper is provided with a division for retaining stones as in the "Columbia."

On revolving the cylinder, the cherries are drawn down past the top half of the Pulping Bar which is fixed at such a distance that the cherries are pulped in passing—the beans being delivered through the opening in the bar, while the skins and pulp are discharged down the shoot between the side-frames. This machine weighs 76 lbs. and when packed in a case 116 lbs. Price, packed for shipment £10.

185.—CRYSANTHEMUMS.

Upon the principle that it is *infra dig*—some never record a failure in the cultivation of plants. It has, however, always been held by this Department that a record of failure is quite as important a feature of work in general, as the record of a success, as it shows us how and in what direction danger lies, and how ultimate success may be attained. At page 22 of this Volume I recorded how successful we had been during 1894, and the early months of 1895, in cultivating a batch of Japanese Crysanthemums. This year, our cultivation has resulted in failure, and this failure has been brought about entirely by the attack of a night feeding insect whose name is as yet undetermined, which has absolutely destroyed many of the plants, and so much damaged others, that no flowers worthy of the name have been produced this season. It has not yet been devised now the enemy is to be met in future, but it is certain the danger must be met and overcome, if we are to continue growing the Crysanthemum. Our experiences has, I learn, been general, for throughout the town district, this class of plants have all suffered alike, and from the same cause. It is to be hoped that we may be able to record a better success next season.

186.—NATURAL HISTORY NOTES.

No. 25—The Corbeau in Error.

Residents in Trinidad are well acquainted with the ubiquitous "Corbeau or John Crow" Vulture, *Cathartus atratus*, for these birds are common both in town and country and act as scavengers by feeding upon all kinds of carrion. Their sense of sight and smell is very keen, and has often been the subject of discussion and sometimes of dispute between naturalists. "Gosse" who wrote on the Natural History of Jamaica many years ago, records some interesting facts in relation to this matter, showing that the sense of smell as well as of sight can be employed at will. My object in writing is to put on record a circumstance which occurred recently in the Royal

Botanic Gardens, in which it was clear that the sense of smell only was employed. In a part of the Gardens a plant of *Aristolochia gigas* var. *Sturtevantii* was in flower. This plant on opening, gives off an offensive odour resembling that arising from carrion. During the morning hours this is more than usually pronounced, and vultures that detect it, at once alight on trees close by, their movements being similar to those they use when in sight of prey. The birds are however disappointed of their meal as it is simply the odour from the flower which brings them to the spot, their sense of smell in this case failing to supply them with a suitable meal. They were in fact "Corbeaux in Error."

24/12/95.

No. 26—*Coccidæ. New sp. & var.*

In the list of Trinidad Coccidæ by Professor Cockerell there is one new species and one new variety. The new species is *Lecanum nanum. Ckll.* which has been found in the covered runs of a species of ant. *Azteca Chartifex.* together with minature specimens of *Icerya Rosæ.* The scale appeared to be imprisoned by the ants building over it a complete covering without outlet except one or two small openings for ingress and egress of the ants themselves. These ants were found located on trees of *Mimusops dissecta*—("Balata") and *Bassia latifolia* which were growing near to each other. The ants appear to make the covered runs, which are composed of woody fibre, simply for the sake of protecting the Coccids as they have for themselves a large nest or homestead where the major portion congregate. I have how-however found in the runs or tunnels which covered the Coccidæ, eggs, larvæ, and pupæ, in all stages, which have possibly been brought there from the nest so as to be near the food supply which is afforded them after extraction from the plant by the Coccids.

The new variety now registered is *Aspidiotus Hartii var. Luntii,* —a variety bearing a close relation to the species found on Yam roots, the description of which was published at p. 85, in the Bulletin for October, 1895.

No. 27—Snake Bites.

"What promises to be a new departure in the treatment of snake bites, was the object of a communication by M. M. Physalin and Bertrand to the Academic of Sciences recently. These savants

believe that the blood of venomous reptiles constitute a real antidote to their virus. They have confirmed their opinion by repeated experiments on guinea-pigs, when the effects of a fatal dose of the poison of a viper were counteracted by an injection of four drops of the blood of the snake. Mr. Bertrand finds that the serum of hedgehogs and adders possess similar antidotal properties. Should these observations be further borne out by experience a new field of experiment will be opened out in the treatment of bites from other and more deadly snakes such as are common in many parts of India."—(*Pharmaceutical Journal.*)

TABASHEER.

By Walter H. Ince, *Ph. D., &c., &c.*

Tabasheer or Tabûsheer is a white, smooth, porcelain-like substance rarely found deposited in the knots of the bamboo, where it forms a saucer-like layer. Owing to the fact that this deposit occurs so seldom, several valuable medicinal properties have been ascribed to it. The Indian population here use it as a specific against fever, malaria and ague. I have been informed that the name—Tabasheer—is derived from the French "Tabatière." This is however more than doubtful, seeing that neither the form, nor the colour, nor the occurence of the substance remotely suggests anything connected with tobacco, snuff or its uses.

A Java variety is said by Tonningen (Jahresb. 1860, 531) to have the following composition :—

Silica	86·39
Oxide of Iron	·42
Oxide of Calcium	·24
Oxide of Sodium	4·81
Organic Matter	·51
Water	7·63
	100·00

I find, however, after examining several samples that have been brought to my notice, that its composition varies very considerably. They all contain large quantities of silica, with indefinite quantities of iron, potassium and calcium. From this it would seem that the substance is not a definite silicate, but silica mixed with accidental quantities of other silicates.

The following are the results of the analyses of Tabasheer :—

	Tonningen's Analysis.	I.	II.	III.
Silica ...	86·39	91·69	89·77	90·46
Oxide of Iron ...	·42	Trace.	·665	Trace.
Oxide of Calcium ...	·24	2·057	3·81	·725
Oxide of Potassium	4·81	4·332	3·35	1·524
Organic Matter ...	·51	·53	·00	3·122
Water	7·63	1·613	3·051	4·13
	100·00	100·192	100·645	99·961

I am indebted to Mr. J. H. Hart, F.L.S., of the Royal Botanic Gardens for bringing this substance first under my notice.

TRINIDAD.

ROYAL BOTANIC GARDENS.

BULLETIN

OF

Miscellaneous Information.

No. 7. JULY, 1896. Vol. II.

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Edited by the Superintendent Royal Botanic Gardens,
J. H. HART, F.L.S.

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1896.

187.—"RUM AROMA."

A SERIES of articles have lately been published in the Bulletin of the Botanical Department, Jamaica, under the above title.

It will be remembered that in the July number of the *Agricultural Record* for 1892, in "Notes of Fermentation," I showed that the Trinidad method of distillation gave "spirit almost devoid of flavour," and pointed out that an examination of the processes followed in Jamaica for the production of the so-called "German Rum" would give interesting results.

Work in this direction has since been taken up by Mr. Percival H. Greg, with a large amount of success, and his results are in course of publication in the above-mentioned periodical under the head of "Rum Aroma."

Mr. Greg's investigation has not yet been concluded but the articles published in August and September, 1895, and January, 1896, appear to demonstrate that the experiments are being conducted with the greatest care, and that it is highly probable, that definite conclusions of the greatest importance to planters will ultimately be arrived at.

Without attempting a review of these articles, it appears from the papers referred to that the Aroma of Rum depends largely upon the boiling house treatment of the cane juice, and the development of a certain and peculiar kind of yeast or fermenting organism which Mr. Greg calls "No. 18."

Mr. Greg concludes his third article as follows:—"It is obvious "however that even the practical side of the question is far from "being exhausted and an ever widening field of investigation is "opened up. If one may be allowed to theorize a little, there seems "sufficient grounds for concluding from the results which I have up "to now attained, that though the Aroma of Rum is in the first "instance derived from the soil, that this influence is chiefly potential "not actual; that it is latent, dormant, and only brought into "existence during the process of manufacture. If this should prove "to be the case, it would seem to hold out a hope that much may be "done to improve our Rum both for the home trade in England and "for export to Germany."

Some may say, but if we do make a fine flavored Rum in Trinidad we shall never sell it! That remains to be seen; and is not such a proposition hard upon the common-sense of the English buyers, who would thus be openly accused of not knowing a good

article? It is fairly clear that up to the present Trinidad has not put a highly flavoured article on the market, but if ever she does, it is more than probable she will get prices in accordance with quality, not at first perhaps—but a good article always meets its market sooner or later, and there appears to be no good reason why Trinidad Rum should form the exception.

It remains to be seen however whether the pure culture of No. 18 yeast will act in the same way in Trinidad upon a "wort" or "wash" made up on the lines of the Jamaica process, or whether there are ferments present here which will not allow of the growths of the special Jamaica ferments. For instance, unless the spontaneous 48 hours ferment grows and alcholizes the Trinidad wash, there is the greatest danger of viscous ferments monopolizing the charge of the vats, and in a few hours the sugar solution may be nothing more than a pasty mass. The ferment spoken of is one of very fast growth, forming in 48 hours the maximum amount of alchohol which it is possible to obtain. It is also one which by cultivation in cane juice can be brought to do its work even more quickly than 48 hours for it has been found that by using a setting of it on new material that a rapid fermentation at once begin, and in 3 hours wash is in a state of rapid fermentation. It is a bottom yeast, almost white, with a resemblance to some of the figured forms of *Saccharomyces cerevisiæ* but with cells apparently much more circular than in any of the recognised forms, and will probably on being examined by an expert turn out to be a new species of that genus.

188.—TRINIDAD ORCHIDS.

It is proposed from time to time to give notes on the various orchids which are natives of Trinidad, with a view of ultimately compiling a small pamphlet for the use of visitors to the Island, who come in yearly increasing numbers, and make large demands upon our time for the purpose of ascertaining what are the most suitable orchids to take away to Europe or America.

Now if a visitor has the appliances at his command for maintaining a high temperature with plenty of moisture all the year round, he may take home and grow a considerable number of the native species in comparative safety and with no little success; but if he has only a greenhouse or the heat of a parlour, in which to place them, he had better leave them alone, and save his time, his money, and his trouble; for most assuredly they will not thrive under such conditions. I know there are persons who will give different advice to this, but I

pity the visitor who relies upon it. A temperature of 75° to 78° Fah. with a minimum of 60° degrees, the orchids of Trinidad must have, or they will suffer largely, and those who wish orchids to grow in rooms, should select species coming from altitudes where the climate is more nearly akin to that of the temperate zone than is shown by the Trinidad register.

If however the visitor has appliances which will enable him to maintain proper conditions, there are several Trinidad orchids well worthy of his notice which can be obtained at reasonable rates, and it is proposed to note such, as each species or variety is passed in review.

The best time for packing and sending away (fixed after many years trial) is during the month of July; a week sooner or later being a matter of no importance. Orchids should be sent in dry cases at this season with ventilation, and in no instance should any kind of packing or stuffing be used, but simply struts or bars to prevent the plants pressing upon one another in the cases.

Oncidium ampliatum.—*Lindl.*

Oncidium Ampliatum., Lindl, appears to have been first described in Lindley's Orchidaceous plants published in 1830, and the habitat was given as "*Panama et Columbia occidentale.*" Reference is made to the same plant in Botanical Register in 1835. Grisebach gives the habitat [Costa-Rica to Venezuela] which includes Trinidad. The orchid is known in Trinidad as the "Yellow bee," and is one of our commonest kinds, some of the branches of native trees in the Garden being sufficiently covered to furnish us with basketsfull of bloom at a single cutting, and is in great demand in its season for table decoration. The variety, *Oncidium ampliatum majus*, grows to a much larger size than the type species, and it is said to be obtainable only from Costa-Rica. There is however an indigenous variety which was termed *majus* by my predecessor, which is so near the Costa-Rican plant as to be hardly distinguished. The difference between the type and the variety is well marked to the cultivator; as the first has short peduncles (1–2 feet) and somewhat spreading panicles, while the *majus* variety is noted for its long (4–5 feet) peduncles and compact panicles. The latteral lobes of the lip in the type are spotted red, while in the variety *majus* they are clear and yellow like the lip. *Oncidium ampliatum* is always to be found in Trinidad in flower in the earlier months of the year, its favourite home being on the upper side of the branches of large spreading trees which afford it partial shade. The plant is one suitable for cultivation in Europe and America.

Oncidium iridifolium, *Kth.*

This Oncidium is really a little beauty, but like many others is a hard one to maintain under cultivation unless the exact condition it requires is supplied. In 1887 I had it first brought in by a native collector and then for seven years I did not again see it—the pieces kept at the Gardens gradually dwindling away.

From the appearance however of the twigs on which it is brought, and from the accounts given by a collector it appears to grow upon the outer branches of trees situated in damp districts, some of the plants being on twigs not more than a quarter of an inch in diameter. Last year we tried it, tied tightly to such branches as I have just described and left it fully exposed, to take care of itself. It has done fairly well and continued to produce its single flowers during the greater part of the year. Our garden however evidently is not damp enough, for the plants put on a shrivelled appearance. On the other hand it is found to be extremely impatient to an excess of moisture. If some orchid fanciers could see this little beauty, as now on the table before me, a single plant with twelve blooms regularly spread out in the shape of a fan, exactly 4½ inches in diameter, they would I feel sure, not rest satisfied until they had placed it in their collection. The plant apparently grows freely from seed as the twigs of the trees on which it grows are covered with plants of all sizes, from the mere speck, to the mature form 4½ inches in diameter.

This orchid must be placed with those difficult to cultivate, although it is a highly desirable one from its rarity and beauty.

189.—NATURAL HISTORY NOTES.

No. 28.—Night Noises.

For sometime during the months of February and March there had been noticed a peculiar weird sound proceeding from large trees in different parts of the Garden. Close observation of the localities for a long time failed to show the origin or cause of it.

The noise might be described as what would be expected from the English or Barn Owl with a sore throat, or like the slow clapping of the wings of some large bird. I directed my assistant and others to endeavour to ascertain the cause of the noise, as many of those who heard it attached no little superstition to its occurrence in the vicinity of dwellings.

Mr. Lunt shortly afterwards successfully detected the author of the noise. Having heard the cry one evening on a large tree under which he was passing, he sought out the direction from which it came and observed a large bird which he took to be an owl. Leaving the spot he procured a gun, returned, and shot the bird, which proved to be on comparison a fellow to specimens in the Victoria Institute of Trinidad collected by Leotaud, which are deposited under the name of *Athene torquatus* Daudin. It is called by French residents *Chouette à Collier* from the markings of its neck.

Leotaud in his Oiseaux de L'île de Trinidad states as follows :—

[Translation.]

Athene torquata without being common, is met with frequently. It stays in buildings or in the midst of thick foliage, or in holes in

the trunks of trees. It requires obscurity during the day, and goes out, only at night, in search of small animals for food. Its cry has a mournful sound, and to ignorant people is a sign of bad augury which chills them with fear. Although they fear it, their hate of it is still greater, and they destroy it without mercy when opportunity occurs. It should however be preserved as it is useful for destroying the mice and rats, but those who are incapable of comprehending the harmony of the laws of nature think nothing of destroying it.

No. 29.—"Petite Chouette."—*Athene phalœnoides, Daud.*

The above is Leotaud's name for a tiny and pretty little owl, which is quite common in the garden and its vicinity. Unlike the subject of No. 28, it cries and feeds in the day time, as well as at night, and sometimes during the day its cry is so frequent and mononotous, as to become quite distressing to nervous ears. Leotaud, in Oiseaux de l'île de la Trinidad says: *Elle est aussi bien diurne que nocturne, aussi l'entend-on a toute heure du jour et de la nuit. Son cri se compose d'une seule note qui semble rendue par une flûte, elle la rèpète coup sur coup et pendant longtemps.* I have at times been obliged—when not feeling well—to have them driven away from the trees near by the office, especially when engaged on work requiring special attention. The bird is not a shy one by any means and will allow itself to be approached fairly close before it takes wing. As far as an owl can be—it is the prettiest of its class that has come under observation.

No. 30.—A Bat's Dining Room.

In many places under spreading trees in the Royal Botanic Gardens are to be found small heaps of the various fruits which may be in season at the time.—more or less mangled and eaten. The observer will learn that these seeds are brought to such situations by the frugivorous bats, which are very numerously represented in Trinidad. Advantage is taken of this fact, as an easy means of obtaining some seeds of our woodland and other trees; and when such are desired, a careful watch is placed upon such spots and the seeds taken possession of early in the morning before day feeding animals can destroy them. Amongst the fruit found on a late examination at one of these places, were those of *Terminalia catappa Psidium guava, Sapota achras,* (Hort.) *Mimumsops Elengi,* (Hort.) *Sideroxylon mastichodendron, Coffee arabica and Camellia thea.* So that it would almost appear that bats like the human species are

apt to take tea or coffee after a dinner of more solid food. Bats do a serious amount of damage among fruit trees, and unless it is protected fly away with *all the best* fruit. They also attack legumes, such as *Phaseolus lunatus*, by opening the pod when about half grown, always from the dorsal side, and abstracting the tender seeds. These fruit and seeds they carry to their feeding place or dining room, which is generally the under side of some shady branch of a tree, where they hang head downwards, their usual position while resting or eating their food the debris, seeds, &c., &c., dropping upon the ground below.

The naturalist will at once see what a splendid arrangement the habits of these animals afford for the distribution of species of plants, and what an important factor is animal life, in the economy of the forest. The writer has often seen seeds of trees in one of these spots, which were known to grow not nearer than a mile from the place where it was eaten; and on the occasion of the last observation, taken when in company with Dr. H. H. Rusby of New York then on a visit to the Colony, Tea seeds were found; while the nearest plants from which they could have been gathered were fully four hundred yards from the spot.

Bats moreover select the best and sweetest fruit, and there is therefore a distribution of seeds *by selection* which probably has an important effect on the evolution of the special varieties which arise.

No. 31—Life History of the Parasol Ant.

The "Parasol" Ant.

Atta (Œcodoma) cephalotes., Latr.
Atta (Œcodoma) octospinosa., Reich.

The destruction caused by various species of "Parasol Ant" in the Western Tropics is a matter of very serious importance to the Agricultural Industries.

To any one but an eye-witness, the amount of damage they are capable of inflicting on growing crops can scarcely be credited, and a constant war has to be waged against them, which forms a very expensive item in the management of estates.

The nests are found of all sizes from one occupying an area of five or six thousand square feet, or more, to one as small as a single foot in diameter; and the cost of destruction ranges accordingly from some 50 cents to $30 per nest. The Parasol Ant is found from Mexico downwards through central and the northern parts of South America, Trinidad included.

In the more northern West Indian Islands however, this pest (happily for cultivators) has not yet been found. Notwithstanding the fact that the Parasol Ant is practically ubiquitous in Trinidad, not a spot in the whole Island being safe from attack, the life history of the insect is but little known to the ordinary cultivator, and it had up to a recent date received but little attention from the scientific world. Of late, however, observations have been carried out which have considerably increased our knowledge of the habits and characteristics of these insects, and it is now seen, as in many previous cases where the life history of insects has been properly studied, that a close attention to the facts will better enable a persistent attack to be maintained upon insects which must be considered as deadly foes to all Agricultural and Horticultural operations.

Classification.

Under the name Parasol Ant must be included several *genera* and *species* of ants. Professor Forel who is a well-known authority gives the following in a publication dated 1893 :—

Genus. Atta.
- Atta lutea., n.sp., Forel.
- A — sexdens, Latr.
- A — nigra, Smith.
- A — subterranea., n.sp., Forel.
- A — octospinosa., Reich.
- A — Moelleri., n.sp., Forel.
- A — coronata., Fabr.
- A — Urichii., n.sp., Forel.

Genus. Apterostigma.
- Apterostigma Urichii., n.sp., Forel.
- A ———— Mayri., n.sp., Forel.
- A ———— Wasmanii., Forel.

Genus. Cyphomyrmex.
- Cyphomyrmex olitor., n.sp.
- C———— strigatus., Mayr.

Some of the above are placed under sub-genera by this author.

Many of these genera are present in Trinidad, so that we have not one "Parasol Ant," but several, different in form but similar in habit. All the fungus eaters however are not to be taken and recognised as "Parasol Ants." This may be done with many species, but some, although fungus growers are known to use other material than vegetable tissue, for the preparation of their "Gardens" as they are called by Möller.

Natural History.

The more important of these insects from a planter's point of view are the two species whose names are at the head of this paper, viz., *Atta cephalotes*, and *Atta octospinosa*. The latter mostly inhabit the neighbourhood of towns or villages, the former being more com-

mon in the woodland districts, though both are to be found in almost every kind of situation.

Bates, who travelled in the Amazon, and Belt, who wrote the "Naturalist in Nicaragua," are both credited with observations on the habits of *Atta cephalotes*, the latter author being the first to note that the ants CARRIED VEGETABLE MATTER INTO THEIR NESTS, NOT AS FOOD, BUT AS A MATERIAL UPON WHICH THE FOOD WAS GROWN, in the form of the *conidia* of a fungus.

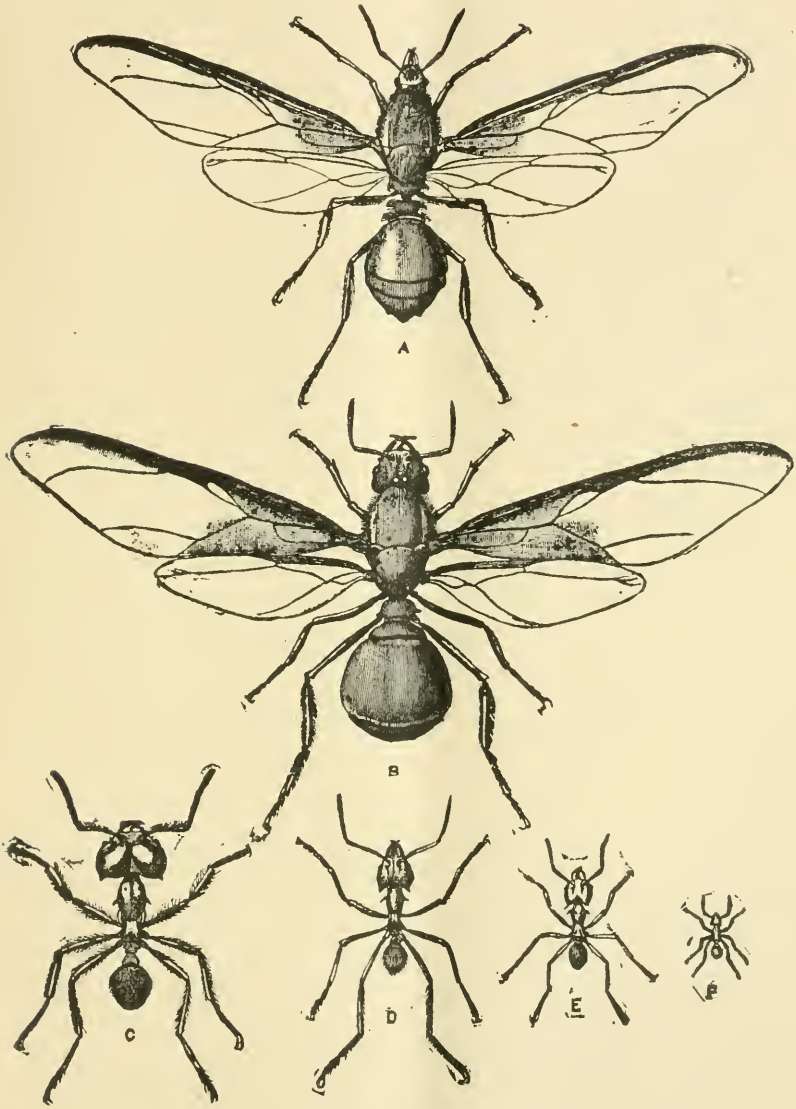
The matter however did not receive direct attention until some years later. Early in 1892 I constructed a few artificial nests, and commenced observations, and a resumé of these was read at a meeting of the Linnean Society in the latter part of 1892. Alfred Möller, a German Naturalist, appears to have been studying these insects at or about the same time, in the province of Santa Catherina, Brazil, in the neighbourhood of Blumenau. It was clearly shown by these observations that the food of the ant was really the fruiting portions or *conidia* of the fungus in the nest, a fact which Belt only surmised.

This was proved by observing the nurses take portions of the food material and place it directly in the mouth of a larva, and the material placed there was proved to be fungus by again removing it and subjecting it to microscopical analysis.

Ants in all the mature stages were also observed to feed directly upon the *conidia* of the fungus, which is the part used by all as food.

Möller, besides noting these facts, traced the origin of the fungus and found it to be the mature stage of *Rozites gongylophora Möller*, which is similar in form, though different in colour, to the common edible mushroom *Agaricus campestris*. It is just possible however that the fungus of our ants nests may not be the same species as that observed by Möller; and it is also possible that the species cultivated by the different kinds of ant are singular to the nests of different species; as some recent observations show that the material used for the growth of the "mushroom gardens," as they are called by Möller differ in the nests of various species. It has also been seen that the form of growth of the mycelium in some nests differs materially from that found in others, which leads to the inference that the fungus may be found to be specifically distinct on closer examination; but of course until the fungus of the nests of the various species is observed in its mature form, it is not possible to determine this point with exactness.

The nest of *Atta cephalotes* contains six different forms as shown by the illustrations.



A is the Male, a large winged form with small head.
B is the Queen, a large winged form with large head.
C is the Soldier, a wingless form with large head.
D is the Worker Major, a wingless form.
E is the Worker Minor, a wingless form.
F is the Nurse and Gardener.

I am indebted to the courtesy of Messrs. Macmillan & Co., the publishers of the "Cambridge Natural History" now in course of issue, for the use of the cliché for printing our illustration. The materials, however, from which the drawings were made were supplied from the Royal Botanic Gardens, Trinidad, to Dr. D. Sharp, the Editor, who has kindly afforded us assistance in making observations by sending us valuable suggestions.

Atta octospinosa has no "soldier" form in its nest, and the queens and workers are much smaller than the like forms in the nest of *A. cephalotes*, and their colour is a lighter red. In some of the nests of the smaller species of Fungus-growing ants the workers are all of one size, and the winged male and female forms are only slightly larger. In Trinidad the winged forms of *A. cephalotes* and *A. octospinosa* emerge from the nest about May or June; when marital functions are carried on, new nests are formed, the males perish, and the fertilized queen seeks a suitable home. It is not however, clearly shown as yet, whether the queen alone is capable of forming and maintaining a nest until she has reared sufficient progeny to take the work off her hands, but it is strongly indicated that she is able to do so. It is however quite clear that *three or four workers and nurses can start a new colony* without the intervention or aid of a queen, as this has been proved by experiment at the Gardens. It is also clear that others besides the Queen can produce fertile eggs, as it has been seen from the experiments we have carried on, that a colony is capable of raising all the forms from eggs laid—when a Queen is not present—either by fertile workers, or by individuals which are enabled to carry on the extension of a colony by *Parthenogenesis*.

An egg on being laid is taken charge of by the nurses, under whose care it passes through its larva and pupa stages, a process which takes about 50 or 60 days. This period is stated, for in a nest under daily observation we noted that an egg passed through every stage in fifty-seven (57) days. When the egg hatches it becomes a larva or "worm," during which time it is diligently and regularly fed by the nurses until it reaches the pupa stage.

In the pupa stage, it takes no food, but remains quite dormant and when ready to emerge, it is again waited upon by the nurses who can be seen to subject the insect to what may be termed a system of *massage*. Numbers of them can at this period be seen assisting the pupæ to get rid of their pupa cover or blanket, after which they can be seen to take the various parts of the body in succession, and by

bending and extending the limbs, moving and twisting the head and abdomen, they seem to induce a revival to a more active state of life, and in due course the subject of their attentions makes a few spasmodic struggles and staggers away with trembling steps to carry on the special duties of the life to which it is born.

In the pupa stage the Queens appear to receive more attention than the worker form, but no especial or royal honours appear to be paid to them after becoming mature, until they have commenced the duties of maternity. The annual flight is probably in part originated by the want of food and not to celebrate their Queen's Birthday, for it has been found in our artificial nests that when numbers of the winged males and females are present the supply of fungus food soon becomes exhausted, and if left to themselves they take to flight. If, however, sufficient food is supplied, (which can be obtained from other nests where no winged form is allowed to develop), the winged forms remain in the nest until the next season. At the time of writing we have an unfertilized Queen which has been kept in this manner since last year.*

While in the nest, the winged forms, male and female, appear to do nothing but eat, day and night from the time of birth until the time of flight, and if examined, they will at all times be found distended with food. This is probably a provision of Nature to enable them to sustain the long fast they have to endure during the time of the annual flight, the swarming, or honeymoon period, for it is fairly certain that they cannot obtain when abroad, anything that will serve as a substitute for the under ground fungus on which they naturally feed.

Although there is no certainty about the matter, it is supposed that, after the necessary marital relations have been completed and the Queen has lost her wings, she seeks for, and takes possession of, a suitable spot in which to found a nest, and the larvæ she hatches are supposed to be fed on re-gurgitated food, the supply being laid up by her as we have previously seen, before leaving the home in which she was born. I have been particular in giving this only as a supposition, but any one who will undertake to study what are really the methods adopted by newly fertilized Queens to found a colony will be doing a great service to the cause of Natural History, and also to that of Tropical Agricultural Economy.

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* *This insect is since dead, but after death the body was always attended by a numerous retinue and allowed to remain in the nest—while the bodies of all other forms that may die in the nest, are immediately carried outside.*

The soldier of *Atta cephalotes* is a very vigorous defender of the nest and justly warrants the application of the name. This is fully shown in the text of the following paper published in the "Annals and Magazine of Natural History," February, 1896, where our observations on this point are recorded :—

ATTA (ŒCODOMA) CEPHALOTES, *Latr.* :—"*The Soldier.*"

(By J. H. Hart, F.L.S.)

IN studying the various forms of the inhabitants contained in a nest of the "Sauba" or "Parasol-Ant" I have observed :—(1) males, (2) queens, (3) soldiers, (4) large workers, (5) smaller workers, and (6) nurses.

Lubbock gives only five classes—1, 2, 3, 4, and 5—the fourth and fifth of which he calls large workers, and states :—"Bates never saw either of the last two kinds do any work at all, and was not able to satisfy himself as to their functions. They have also been called soldiers, but this is obviously a misnomer —at least they are said never to fight. Bates suggests that they may serve in some sort as passive instruments of protection to real workers. Their enormously large, hard, and indestructible heads may be of use in protecting them against the attacks of insectivorous animals. They would be on this view *pièces de resistance*, serving as a foil against onslaughts made on the main body of the workers."

Lubbock then states* that he is not satisfied with this solution, and thinks the true function of these large-headed forms is not yet satisfactorily explained.

I have personally had the advantage of studying the insect both in Nicaragua and in Trinidad, and I must agree with him, for the observations I have made clearly show the "soldier," or No. 3 of my set, to be actually a "soldier," and a most resolute defender of the nest in which *he* (?) resides.

If a nest of *Atta cephalotes* is visited and the slightest disturbance made, the first members which appear are the "soldiers," who will seize any and every thing presented to them or that comes in their way. I have suffered myself to be bitten on the hand by one of them, and have watched the process.

The mandibles are first fully extended and the skin is firmly grasped by the points, but as the pressure is continued the mandibles meet below the skin to a depth of 3 to four millim., causing a neatly incised wound sometimes as much as 5 to 6 millim. in length, and resembling a cut from a small knife. The grip of the animal is so tenacious that it will allow its head to be pulled from its body before it will quit its hold, and will fix to iron, flesh, or cloth with equal facility.

Mr. Lunt, my assistant, when visiting a large nest had thick woollen socks so cut through by the "soldier" of this species that they were useless for further wear.

If a nest is visited and an alarm caused by putting a piece of iron, stick, or other instrument into their holes, it is sure, when removed, to be covered with the "soldier" ants hanging to it by their mandibles.

In addition to these facts I have seen in my artificial nests, which I have had under observation for some three years, many fights with the "soldier."

The workers of *Atta octospinosa*, Reich., among which there are no "soldiers," can easily kill the "soldier" of *A cephalotes* : they proceed as follows :—The "soldier" is attacked in regular order by *six* or *eight* of the *octospinosa*, who completely surround their victim, and watch their opportunity to seize the outer joint of his (?) legs. This is cut off, and gradually the creature

* "*Ants, Bees and Wasps.*"

is deprived of these appendages joint by joint, and ultimately is left to move on mere stumps, when it dies in a few hours. In doing this, the smaller insects take particular care not to approach within the reach of the "soldier's" mandibles, as to do so is certain destruction to the individual who has such temerity; they seldom do so, but on the contrary, the object appears to be to keep as far away as possible and to hold the legs fully extended while effecting their object of cutting them off piece by piece.

"Soldiers," again, when placed together fight among themselves, and a bodiless head and thorax is frequently seen stalking about after such meetings. When placed together in spirit they at once seize one another and form themselves up into a complete mass, which is tightly held together by the mandibles.

The "soldier" of *Atta cephalotes* is the same in form in Nicaragua as in Trinidad, and possesses the same powers of defence and offence.

Trinidad, January 9, 1896.

The duties of the larger and smaller forms of workers are to cut and bring in the pabulum or material on which the fungus grows which serves them as food; to help in the defence of the nest, and to act as carriers of the eggs, larvæ, or pupæ in case of a migration. They cut and bring in leaves, twigs, flowers, fruit, and in fact almost every kind of soft vegetable matter, and in so doing a large nest will often strip a forest tree of its leaves in a single night. When the leaves are brought into a nest, they are first cleaned or licked over and then chewed up in little balls, which are placed one upon another, like an irregular pile or heap of bread in a baker's shop. Amid these little balls the mycelium soon spreads, and in a short time little bunches of *conidia* called by Möller "*Kohl-Rabi*" make their appearance, forming tiny white *points* on the spongy surface, and it is this portion of the fungus which FORMS THE FOOD BOTH OF THE LARVÆ AND MATURE INSECTS, AND NOT THE LEAVES WHICH ARE CARRIED IN, which are in no case eaten by these insects.

The form known as the "Nurse" also appears to act as gardener and scavenger, and no other but the special fungus on which the ants feed is allowed to make its appearance in the nest. It appears almost certain however, from actual observation, that the nurses (possibly under orders from higher authority) are able to raise from the egg—or an egg—any form they may require, simply by the method they adopt for feeding the larvæ, for it has been observed that the greatest development takes place during this stage, and that once the larva assumes the pupa form we can readily determine what particular class of insect will emerge therefrom; the queen appearing to be the highest developed form and the nurse the lowest, the latter taking the shortest time and the least food, and the former the longest time and greatest amount of food.

A *resumé* of the life history of *Atta cephalotes* may be convenient :—

1st stage	...	...	... The egg.
2nd ,,	...	..	... The larva.
3rd ,,	...	...	.. The pupa.
4th ,,	...	...	... The imago or perfect insect.

(*a.*) There are six forms of the insect produced in the nest, but the ant once hatched from the larva stage never grows, but remains the same size as when it issues forth. A Queen is a queen from birth and the nurse, the nurse, &c., &c.. &c.

(*b.*) Males and queens only, are furnished with wings. The wings of the queen are lost soon after fertilization.

(*c.*) It is possible for workers to start a new colony without the aid of a queen.

(*d.*) It is deemed probable that a fertilized queen can found a new colony without assistance.

(*e.*) An egg left to itself will hatch, but the issue will starve or die without aid from the nurses or queens.

(*f.*) Ants by a system of feeding appear to be able to develop whatever form of insect of their own kind they may desire.

(*g.*) The greatest activity in the nest, and consequently the most damage done by these insects is during the early months of the year ; as more food is required at that time for the development of the queens and males.

(*h.*) The queens and males are only produced at one season about April—June, but workers are produced all the year round.

(*i.*) Nests of Parasol Ants will migrate if disturbed and will again return if they find a secure retreat.

Methods of Destruction.

Innumerable are the means which have been devised from time to time to destroy the nest of the "Parasol Ant," "We-We" or "Bachack" as it is called in various places. Each operator has his favourite method, and each district a different manner of procedure ; generally speaking however these methods come under four heads.

1st. Puddling or digging or pounding.

2nd. By the use of poisonous gases or vapour.

3rd. By the use of Coal tar or Corrosive fluids.

4th. By fire.

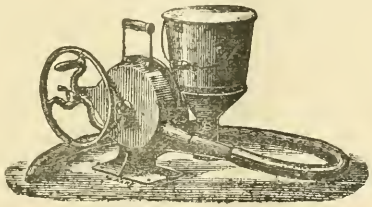
The agriculturist should not bind himself to adopt any one of these methods to the exclusion of the others. If he finds a case in which one method can be better, more economically, and effectively applied than the other, the operator's judgment and discretion should direct him which he should use for the accomplishment of his purpose. There can be no doubt that these ants can be effectively destroyed by *many different means*, but to use such means indiscriminately without taking into consideration the position of the nest would be manifestly absurd.

Puddling or digging is evidently a very cheap and handy means of destruction if the nest is small and situated in friable or easily dug soil, near to a supply of water.

If, however, the nest is situated in brick work, among tree roots, in rocky soil, or is very large and far from water, it must be evident that puddling or digging would become a very troublesome and expensive operation.

Poisonous fumes should be used only on nests where they can be easily generated without danger to human life, and forced in, in such a manner as to fill every portion of the nest. But if used in situations where it is impossible to confine them for the required time, or in places where the gases escape without filling the nest, the application usually, fails. The fumes which are given off by a solution of Cyanide of Potassium are useful for destroying nests in some situations, but as this chemical is a deadly poison it requires to be used with the utmost care

Sulphur fumes forced into the nest seals the death-warrant of all insects that are there at the time. This is effected sometimes by a pair of bellows but is more economically accomplished by the Asphyxiator, a machine much used in Europe for the testing of drains, and the destruction of rats and mice in situations underground.



It has been adopted in Trinidad for the purpose of destroying ants nests, and *there can be no doubt* that for this purpose it is both practical and effective when properly used. It consists of a small chamber containing a centrifugal fan, much after the pattern of a forge blower, which draws the sulphur fumes from a small combustion chamber and discharges them into the nest through a rubber tube by one of the main openings. In using the Asphyxiator, the chief points are, to see that the fan is properly working, to see that the combustion chamber is properly supplied with sulphur, and to see that the orifices or openings of the nest are properly stopped as soon as the smoke is seen to emerge therefrom.

Coal tar is a very useful agent, but to try and force coal tar upwards, or to place it, or any corrosive fluid, at the

entrance of a nest which runs from the aperture in a horizontal or ascending direction, is evidently impracticable, but it may be used very effectively where nests are situated below the level of the entrance. Coal tar is not only destructive to those in the nest, but those outside on coming home are liable to be entangled and destroyed by it, and moreover the nest on which it has been used will not again be occupied, until all signs and smell of it has disappeared. Even large nests may be effectively and economically destroyed when situated below the surface of the ground. A large nest in one our Town squares was completely destroyed by this means three or four years ago and has not since reappeared.

The use of fire is very economical, but large and small nests can only be destroyed by fire when situated in such positions as will allow of the use of this agent. In pastures and in new clearings it is probably as effective and as cheap a means as can be used, if the effort is properly directed. It is not sufficient however to heap up a pile of burning bush upon a nest and maintain it on fire, for the ants will beat a convenient retreat to the inner chambers of the nest, and when the fire has burnt out, will either migrate or start anew. In attempting the destruction of a large nest by this method, a watch should be set, and torches used, to destroy all incoming ants, resting assured that the ashes covering the seat of the nest will for a time keep back those which are inside. In a day or two however these will commence working, but on newly cleared ground they can be readily seen and should be at once destroyed by any handy means such as torch, gunpowder, or by sulphur fuse or squib, used on the entrances as they are opened from the inside.

Nests may also, when small, be entirely destroyed in soft ground by the simple pounding or ramming hard each entrance hole once or more daily.

In attempting the destruction of any, even the smallest nest, it is seldom that one operation is sufficient, for we have seen that the ants are regular outside travellers, and we can never be sure that some are not outside. There will be always some people who will say after the most effective operations, that the ants were not destroyed in the nest; especially if it is not the system they favour, because they are able to find ants in the same nest a week afterwards. Now we have already seen that three or four ants are able to re-construct a nest, or form a new colony, and is it not likely that the ants they find in the nest are more likely to be those which were outside at the time

it was operated upon, which, having returned have commenced their nest anew?

In using chemical fumes also, there may be some chamber which has not been reached, and in which ants are alive. This will, if left, certainly carry on the nest, and it is certain that chemical fumes cannot kill those which were away from home at the time they were applied. Some nests also are held by separate families and although they form one community, still their burrows or runs are separate and distinct, and if one such run, burrow, pocket, or nest is left untouched, the nest must of course be considered as incompletely destroyed.

The course pointed out therefore, is for planters to continue a persistent and daily attack until they are certain the insects are exterminated, whatever the means used, and not to think that any method or system will, IN A MAGICAL WAY, ONCE AND FOR ALL, DESTROY BY A SINGLE APPLICATION. Certain it is, no system can or ever will do this until we can devise means to attract every wanderer home previous to setting about the operation of destroying the nest. Water will drown, Tar will stifle, Sulphur will asphyxiate, Cyanide of Potassium will poison, and Fire will consume, but unless carefully and continuously applied, the operator will fail to effectually eradicate the Parasol Ant; but if he pursues the policy of waging ceaseless war, and treating a parasol ant's nest as he would a house on fire, (*i.e.*) attempt to subdue it as soon as seen and continue until he has extinguished it, and if (happy day for Trinidad) all the planters were a join in a united attempt at the same season, this pest would not do the damage it now does to Agriculture, but would soon be reduced in numbers, and practically harmless to our Agri-Horticultural Industries.

No. 32—Origin of Sex.

The question of the origin of sex, has long been a difficult one, but our knowledge is being gradually extended.

In H. J. Webber's article in "American Naturalist" (February, 1892), he recapitulates the results of some of Young's experiments, in which among tadpoles the percentage of females was 57 in a hundred. Fed on beef the percentage of females was raised to 78 per cent. Fed on fish to 81, and fed on the flesh of frogs the percentage of females became 92, or 92 females to 8 males out of every hundred. And these changes are possible, owing to the tadpole "passing

through a hermaphrodite stage in common, according to some authors, with most animals." That the "parasol ant" has the power of arranging what sex its young shall be and also what form they shall assume, has been fairly proved by observations taken at the Botanic Gardens. It has also been stated in *Cape Agricultural Journal*, November 28, 1895, that by adopting certain measures and matching males of certain ages with females of certain ages, combined with an abundant supply of food, a majority of ewe lambs can be confidently relied on; while opposite measures produce a large percentage of males. This progress in the knowledge of the primary form of life has been so rapid of late years, that a relation of it to the unstudied, seems to them like a chapter out of the "Arabian Nights" or some wonderful and mysterious book. By the general public scientific facts are rarely understood until they affect the political or domestic economy of a people, and then their eyes are opened and wonder expressed why they were not able to discover such apparently simple things themselves. However there is no doubt that an advance has been made in determining the causes of the variation in sex, and although as yet there is no apparent certainty there is that which leads to the inference that the further development of methods of study will reveal more of that which is even yet, a somewhat hidden page.

190.—ONIONS—*Allium Cepa., Linn.*

Spasmodic attempts are at times made by local publications to induce the planters of the various islands to undertake the growth of Onions.

From several of the Islands we frequently see records of the growth of onions; Mr. Hobby-horse is related to have produced one actually four ounces in weight, Mr. High-success grew two, which between them weighed three quarters of a pound, and so on; but few or none of them have told of the expense of sowing, growing, reaping or the weight and full value of the entire crop grown. The want of the latter information, together with a credit and debit account is what is required to show whether it is advisable to continue the efforts to grow onions.

It may be mentioned that the writer's first attempt in the West Indies was made over twenty years ago, and our advice on the subject to those seeking it, has ever since been as follows :—

While readily admitting that onions could at times be grown of

fair size and quality, if a suitable season is chanced upon, yet taking all conditions into consideration, we advised that it would *seldom pay the cultivator* for the time and labour expended.

1st. In consequence of the very numerous insect enemies there is to contend with ;

2nd. On account of the variable character of the climate, and the heavy rains experienced at times :

3rd. On account of the difficult artificial conditions which have to be maintained to counteract the first two reasons ;

4th. On account of the prevailing temperature being much higher than that of countries where the onion is indigenous or well acclimatized.

The native country of the onion according to De Candolle, the eminent French author, is very uncertain* but he gives evidence that it has been cultivated in Southern Asia and the Eastern region of the Mediteranean, from a very early period. He also mentions it being found in a wild state in Beluchistan, Afghanistan, and the mountainous regions of the Khorrasan. It has also been found in Western Siberia. The climate of these countries and that ot the present centre of modern civilization, show that it flourishes where the humidity is much less and the temperature much lower than in the West Indies.

Besides this, there is little doubt that the centuries of cultivation in Europe has produced a form of onion which is specially suited to the climate of that part of the world, and less suited perhaps than the original wild variety (whatever that might have been like), to our West Indian climate. Hence we have the white Spanish—the Portugal—the Tripoli—white Italian—the Strasbourgh, &c., &c., &c.—showing, the various forms that arise in different countries, while English and American varieties are also numerous.

There is, we fear, little hope of possessing ourselves of the seed of the wild variety and still less hope that we may be able to acclimatize sufficiently to fit it for economic culture in our climate. It is therefore compulsory on us, in attempting to grow the onion to use seed which has been raised in a cooler climate than that in which we live. As I have before mentioned, long years ago it was a well ascertained fact that under favourable circumstances onions

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* *Origin of cultivated plants.*

can be grown, but whether it is worth while to grow them; or whether on an average of years they will pay the grower, is in my humble opinion, quite another question, or "a horse of another colour."

I have however been induced by those who enquire about such things, to make various trials, from time to time, but in not a single instance has the conclusion come to in the first instance stood in need of modification or correction. The result of the last trial is put on record herewith so that would-be cultivators may judge for themselves whether or no, it offers encouragment. It may be explained that seeds cannot be sown in the open beds in Trinidad, as ants and various other insects at once destroy them previous to germination, and therefore a water surrounded spot has to be used for the germination of nearly every kind, which have perforce to be sown in boxes and transplanted.

The seed was sown (May 1895) in boxes, was transplanted once, and planted out finally in September in a bed 30 feet long by 4 feet wide. The weight of onions in the total crop was a trifle over 3 pounds and the largest of the lot weighed three (3) ounces. They were harvested April, 1896. The cost was as follows:—

Dr.

	£	s.	d.
Seeds	0	0	6
Postage	0	0	1
Boxes—six @ 3d.	0	1	6
Transplanting into boxes ...	0	1	3
Preparing ground	0	0	7½
Planting	0	1	3
Labour, shading, watering, weeding, &c., eleven months	0	5	6
Harvesting	0	0	3
	0	10	11½

Cr.

	£	s.	d.
By 3 lbs. onions @ 2½ per lb.	0	0	7½
	0	0	7½

Now Madeira onions of first class quality can be bought nearly all the year round at rates ranging from 1½d. to 2½d. per pound in Trinidad.

Whether the above Debit and Credit account is one likely to give encouragement to onion growing, I leave my readers to judge. It is made out taking minimum cost, and may be taken as fairly corresponding with previous trials. The experiment I may add, was conducted by one who many years ago grew and exhibited, in Oxfordshire and Berkshire, the once celebrated and still catalogued "Nuneham Park Onion," a variety of the white Spanish that in its day took various first prizes at some of the best Horticultural Exhibitions in England.

With us it will be seen Onions cost over 3/7 per pound, while over twenty pounds of imported onions of excellent quality can be purchased for the same money.

It is not what we can grow that should occupy the attention of our people, but what we can grow economically and at remunerative rates.

191.—CEDAR—*Cedrela odorata, L.*

Residents and natives of the West Indies are in general well acquainted with the West Indian Cedar and its uses, but American and European visitors and "stay at homes" of other lands have not the same acquaintance with this famous tree, nor are they well informed of the class of wood to be looked for when the word cedar is mentioned. This is not much to be wondered at when we find that there are woods from all parts of the world known as cedar, as well as the West Indian, produced by trees of very different character, and far removed from each other by Botanical classification.

The common name Cedar, is applied to the wood of *Juniperus virginiana,* or Virginian Red Cedar which grows in the United States. By some there is no distinction drawn between this and *Juniperus Bermudiana,* or the Bermuda Cedar. The wood from these two is practically indistinguishable; it is used for the same purposes, and a fine essential oil can be distilled from either. Taking the two as one *species* it is found to be present in Cuba, Jamaica, Hayti, and by cultivation (if not otherwise) in several other West Indian Islands. A large pencil manufacturer recently applied at this office for information as to the possibility of growing it in the West Indies on a commercial scale as he anticipated a scarcity of the Virginian wood. He was informed that the tree was apparently indigenous to the hill lands of Jamaica and Cuba, and that large areas in these islands could be readily devoted to its cultivation if inducement offered. It could hardly be expected however that property owners would expend large sums on planting pencil cedar as a speculation unless under some guarantee; but it is nevertheless clear that if certain sums were judiciously expended a steady supply of these woods could be maintained, sufficient perhaps to render the manufacturer independant of American supplies.

In Trinidad our lands are not so well suited to the growth of this tree as Jamaica, Cuba, Hayti, &c., as we do not possess any large areas of elevated land, but even here, there are spots on our hill-sides which might be turned to good account for this purpose. The tree will grow even at sea level, and attain a fair size, but in the language of the cultivator it does not appear to be "happy" in such positions (*i.e.*) it does not put on a sturdy, robust, or well grown appearance and is hardly likely to be profitable grown at such elevations.

Other cedars are the "Cedar of Lebanon," *Cedrus Libani, Barrel.* The "Deodar" or "Indian Cedar" *Cedrus deodara, London.* The Mount Atlas or "African Cedar" *Cedrus atlantica.* The New Zealand Cedar—*Libocedrus Bidwillii Hook* and the Australian Red Cedar. *Cedrela toona,* Roxb., a tree belonging to the same genus as our West Indian or Creole cedar. There is also the white cedar of the Northern West Indian Islands which is the wood of a Bignoniaceous tree *Tecoma leucoxylon, Mart.*, a genus to which that famous yellow flowered hardwood tree called the "Poui" belongs. The latter is a special feature in the Trinidad landscape, as the hills are ablaze for miles during spring weather in March and April with its glorious show of bright yellow flowers. As a "cedar" however, the wood of *Tecoma leucoxylon* has not much in common, not even colour, with the well known market varieties. The North Americans have a "Red Cedar," all to themselves, and this "cedar" is found to be produced by the tree known as *Thuja occidentalis* or the American "*Arbor Vitæ*" of which there are several varieties. The wood is durable, red, and it may be possible by a great stretch of the imagination to draw a resemblance between it and other better known "cedar" woods.

On the eastern coast of North America there is also found a "White Cedar"; a wood furnished by the tree known as "*Cupressus Thyoides, Linn,* and *Libocedrus decurrens, Torrey,* is also known as the Californian White Cedar.

We have therefore the list as follows :—

Juniperus Virginiana, Linn ...	... Pencil Cedar.
Juniperus Bermudiana, Linn. ...	... Bermuda Cedar.
Cedrus Libani, Barrel ...	... Cedar of Lebanon.
Cedrus Deodara, London ...	... Indian Cedar.
Cedrus atlantica, Mamth ...	... Mount Atlas or African Cedar.
Tecoma leucoxylon, Mart ...	... West Indian White Cedar.
Thuja occidentalis, Linn. ...	... American Red Cedar.
Libocedrus decurrens, Torrey ...	... Californian White Cedar.
Libocedrus Bidwillii, Hook ...	... New Zealand Cedar.
Cedrela Toona, Roxb. ...	... Australian Red Cedar.
Cedrela odorata, Linn. ...	... West Indian Cedar.

It will easily be seen from this list, which is not exhaustive, what a difficult subject the determination of the word "cedar" must be to any but those acquainted with the Botanical characters of the various plants producing woods known under this name, and the woods themselves may be quite unrecognisable without the aid of Botanical specimens for identification.

The "Cedar" of the West Indies however bears very distinct characteristics. It is known to Botanist as *Cedrela odorata L.* and belongs to an order of plants called the Meliaceæ; an order to which the well known Mahogany (*Swietenia Mahogani, Jacq*) and Carap (*Carapa Guianensis, Aubl.*) also belongs; and is the only "Cedar" I have mentioned, except *Tecoma leucoxylon*, which does not belong to the order *Coniferæ*. As I have previously indicated, some Botanists consider *Juniperus Bermudiana*, and *Juniperus Virginiana* to be forms of one species, others consider *Cedrus Libani*, *Cedrus Deodora*, and *Cedrus Atlantica* should only be considered varieties of one species, but as our concern is not specially with nomenclature, it can well be left to specialists at various Botanical centres to determine such intricate and knotty points.

Cedrela odorata L., is a large quick growing tree and it is native of the Neo-Tropical Region, which includes the West Indies. Figures of it are given in Sloane's Natural History of Jamaica, and also Brown's Jamaica, the latter giving at p. 10 f. 1 excellent figures of flowers, leaf, and capsule of the plant.

The following description is taken from Grisebach's Flora of the West Indies :—

CEDRELA, L.

"*Calyx* 5-lobed. *Petals* imbricative, oblong; midrib on the inside furnished with a plait, which adheres to the gynophore. *Staminal tube* wholly combined with gynophore: fertile filaments 5, long, inserted on its top. Ovary 5 celled: cells 8—12, ovulate. Capsule dehiscent from the top: seeds with a terminal wing; albumen thin. Fœtid trees; leaves *pinnate; panicle* large, terminal.

Cedrela, odorata, Linn.; *Leaves* imparipinnate; *leaflets* 5—8 jugal, oblong, oblique at the base, petiolulate; *petals* pubescent; capsule ovoid, sub-costate. A high tree; leaflets variable in being broader or narrower shortly or long petiolulate; panicle drooping, often above one foot long; flowers pale yellow."

The tree is a very fast grower in its younger stages and the wood is of the greatest service, and commonly used for many pur-

poses. As a building wood for frames and timbers, it is useful and durable, and cedar boards are all that can be desired for house building, and cabinet work. Cedar presses for clothes, cedar cabinets, cedar tables, are among the very best in use, and for wardrobes it is considered to be in advance of all other woods from the character it has of not habouring moths or other insects. The wood is also largely used for the manufacture of the well known cigar boxes, and where the tree is common, small flat pieces sawn or split, called "shingles" are used for the covering of buildings, and a roof made of well seasoned cedar, is one which is known to outlast everything of its kind.

In central America where trees of the largest dimensions can be obtained, it is used for making boats, sometimes "dug out" and sometimes "built," which are light and very lasting, but they should always be kept out of the water when not in use, as the wood is slightly absorbent and the boats become heavy if left in the water, and this applies more especially where they are not kept well painted.

The tree when in flower gives out a very peculiar odour, which is overpowering to some and is sometimes called *fœtid*. The wood also when fresh cut, has a harsh and rather unpleasant smell, but with age this disappears, and well ripened wood gives off an odour very much liked, and many use wardrobes and presses of cedar by preference for wearing apparel, simply to give them by contact the sweet and peculiar smell of the wood.

Sometimes the trees reach the enormous height of 90 to 100 feet or more, and I have seen trees with a diameter of twelve feet at the bole, but this of course is unusually large. In Trinidad and Jamaica the growth of the tree is very steady and regular, and with us in Trinidad probably faster than in Jamaica, as our climate seems rather better suited to its growth.

On the average the planter may calculate on a diameter of one inch per annum. If planted in good soil, a tree twenty years old would probably have a stem or trunk twenty to twenty-five inches in diameter. Of course a contrast to this will sometimes appear, for if planted at great distances, in poor soil, and if left unprotected, a slow growth and stunted character is all that can be expected and certainly is all that any planter who gives them such treatment deserves.

Altogether the planting of West Indian Cedar through the West Indian Islands, a few of the most wind blown perhaps excepted, is an

enterprize which should recommend itself to the capitalist; for if he looks at the price of the timber of the present day, and the outlook for the future, there are certain and sure signs that he who possesses an estate covered with this valuable timber in a convenient spot for haulage and shipment has an investment which is superior to many of those which the present day offers.

The planting is easy and inexpensive, the attention required at the outset is but little in comparison with other cultivation and when once established, the trees practically take care of themselves and grow into money. Cedrela Wood Oil is also obtained from *Cedrela Odorata.*

In the semi-annual report of Messrs. Schimmel & Co., Leipzig and New York the following appears :—

Oil of cedar wood (*Punta Arenas*) Costa Rica, colour yellow, yield 3·06 per cent. boiling between 265 and 270°, sp. gr. 0·915, Optical Rotation—5° 53′ in 100 tube consists mainly of sesquiterpence and yields dichloric-hydrate (Cadinene hydrochloride) having the melting point of 118°.

192.—MAHOGANY—*Swietenia Mahogani, L.*

This tree like the "Cedar" *Cedrela odorata* grows rapidly and produces excellent wood in the Island of Trinidad. Grisebach in his flora of the West Indies makes it indigenous to Trinidad, but this, as stated in "Corrections" to that work, is questioned by Cruger, and I think rightly, as I can certainly find no sufficient evidence that the tree is indigenous here. It is also given as a native of Jamaica and Bahamas and it is well known to be indigenous to Central American Countries from Mexico Southwards; a large export trade being done by some of these countries especially by British Honduras, and "Honduras Mahongany" is a well known mark in the markets. The tree however is found commonly throughout the West Indies, and whether indigenous with us or not matters little, so long as we have the knowledge that it thrives well and produces excellent timber. In the year 1876 I planted trees in the lowlands of Jamaica which during the time they were under my care gave a yearly average growth of one inch diameter of stem. I planted some in Trinidad in 1889 and the average of these now give a trunk considerably over seven inches in diameter and some thirty feet in height. Trees planted in the early years of these gardens are now of large size and have for a series of years furnished excellent timber of

the best quality; some of which was used in building the Governor's Residence at St. Anne's. The garden was started in 1818, or 78 years ago, so that they may be estimated to be about 60 years old. Some of these give trunks over four feet in diameter so that the average growth for a series of years including youth and maturity may be taken at $\frac{9}{10}$ of an inch per annum which I think is fairly correct and reliable average growth when planted in fairlygood soil. There are of course places in which from character of soil and various other causes, trees would probably give not more than half these results, but a great deal depends upon the care and attention they receive. I have acquantance with a case in point. A forest was cut down and the land laid bare on an area of many acres. The land was not good, and the aspect and situation was, dry at one season and flooded at another. The trees were planted some thirty or forty feet apart and not protected in any way, cattle pulled them down, the wind broke off branches, and no attention was paid to them for years. The rule with them has been slow and stunted growth, and in 15 years they have made little progress. This is not to be wondered at for few trees of any kind would have thriven under similar circumstances. Now there should be no excuse for a failure of this kind, for it is evident that those who had the care of these trees could have had no training on wood craft, or in fact any practical knowledge of the principles of that art, for if they had they would have known that the first rule of the forester is to plant thickly and the first cost of plants should never be a bar to carrying out this practice, which is one pursued hundreds of years ago in the forests of Europe and still carried on in the same way to-day where practical forestry is properly understood. Cover the ground first, and thin afterwards, plant thickly and you can choose year by year what has to be removed and the thinnings will pay for the cultivation. If a planter wants forest trees say 40 feet apart he should at least plant his ground in not less than ten feet intervals. For example; on a square of forty feet he would have to plant twenty-five trees; out of which he will eventually have only four as permanent timber—the other twenty-one falling, as necessary to give room for growth of the others. Thick planting affords a protection and induces a growth which can be had in no other way, and it is a practice that should be pursued if success in timber culture is to be secured, and it is but little use to plant otherwise, except in particularly favoured situations. The Mahogany produces seed freely in some climates but like many other trees does not give regular crops. The seed however when produced grows

freely and the seedling are of a rapid growth and very hardy. Looking to the probable out-put from Central American Countries and the regular demand for this wood. It is fairly certain that he who cultivates Mahogany in the West Indies at once, and with a determination to do it well, and on a fairly large scale, will succeed in making land that is now improfitable and valueless, into estates which will give to their owners, in due time, a regular and substantial return. Of course in matters of this kind the first question asked is what will be the costs of planting. An answer can be easily and truthfully given. The cost of planting is a small one. Say we plant at 10 feet apart, 435 plants will be required for each acre or to allow for supplies say 500 plants. These should be grown in nurseries for at least two years and the cost should be but trifling as any intelligent labourer should be able to attend to them in the intervals of other work. And the practice which it is necessary to persue can always be learnt by sending a man to the Royal Botanic Gardens for a short time. We can raise them here at a cost of some two cents, 2c. or one penny each and planters should certainly do it for the same money. It will thus cost some $10 per acre for plants. The planting can best be estimated for by the planter himself, but he should see that it is properly done, and when this is done it is highly essential that the plants should be protected from inroads of cattle, for the first few years at least. So that the surrounding growth does not over-shadow the plants or grow too near them, the thicker it is the better and it is not ncecessary to clean or brush except to keep the plants clear and to see they are not overrun by climbing plants. After the first 4 or 5 years the plants, if in fair soil, should be beyond the reach of stock and protection will not be required, but if possible keep stock away altogether. The best way for a planter to commence is to fence in half an acre or an acre in different localities as trial plots and to increase his area if his plants thrive, and the position is found a suitable one.

193.—VANILLA—*Vanilla planifolia.*

A SMALL quantity of Vanilla grown and cured in the Garden was sent home in the beginning of the year and was valued by a large firm at 10/- to 11/- per lb. *Vanilla grandiflora* and *Vanilla phœnantha* also produced fruit. *V. grandiflora* produces a large meaty pod having a fine perfume, but V. phœnantha is of no great value for cultivation, as though sweet, its pods are much too small to take the market.

194.—BOTANICAL NOTES.

No. 5—*Cynometra Trinitensis*—*Oliver.*

It was stated in No. 5, Vol. II. p. 122 that Professor Oliver would shortly describe in Hooker's "Icones Plantarum" a tree which is growing in our Gardens. Through the kindness of W. T. Thiselton-Dyer Esqr., who edits this publication for the Bentham Trustees, I am possession of a copy of Professor Oliver's description and it is here given in full. With the description there is a most excellent figure of the leaves, flowers, and fruit, but for obvious reasons this cannot be reproduced in our Bulletin.

Cynometra Trinitensis—*Oliv.*

Leguminosæ. Tribe Cynometreæ.

C. trinitensis, *Oliv.* (*sp. nov.*); foliolis unijugis plus minus coriaceis valde inæquilateralibus oblique ovato- v. oblongo-ellipticis obtusiuscule apiculatis glabris, florum fasciculis axillaribus sessilibus multifloris, bracteis late ovatis concavis striatis fusco-puberulis caducis, pedicellis pilosulis bractea longioribus, calycis segmentis 4 longitudinaliter venosis inæquilateralibus, petalis 5 calycem superantibus subæqualibus subcymbiformibus acutiusculis 1-nerviis pennivenis, staminibus 10, filamentis glabris, ovario brevissime stipitato compresso parce pilosulo 1-ovulato, legumine subgloboso v. leviter compresso, pericarpio tenuiter crustaceo obscure papilloso-verrucoso sublævi.

Hab. W. Indies: Trinidad, *Cruger, Prestoe, &c.*

Arbor mediocris, corona densa; ramulis glabratis crassitie pennæ corvinæ, ultimis pendulis. *Foliola* brevissime petiolulata 3–4½ poll. longa, 1¼–2 poll. lata; petiolus 4–6 lin. longus. *Fasciculi florum* 1–1½ poll. diam. *Calycis* tubo brevissimo. *Stamina* alternatim breviora; antheræ parvæ, versatiles, late ellipticæ. *Legumen* 1–1½ poll. diam.

This fine species has long been in the Kew Herbarium, but not hitherto satisfactorily determined, and the recent receipt of excellent specimens from Mr. Hart has again brought it under notice. It was regarded by Dr. Grisebach (*ex descr.*) as *C. crassifolia*, Benth. (described from specimens in the Paris Herbarium), but Mr. Bentham did not confirm this, and thought it might prove to be *C. americana*, Vog. Dr. Schumann some years ago kindly compared a specimen for us with Vogel's type, and found it 'quite different.' It resembles *C. ramiflora*, L., of India, but the fruit is entirely different.—D. Oliver.

No. 6—*Schizea elegans.* Sw.

During the month of March there was received in the Herbarium several specimens of this fern taken at Valencia in the northern district of the Island. It answers very well indeed to Baker's description in Synopsis Filicum and one specimen is decidedly an intermediate stage between the type and the variety. *S. Flabellum Mart* of which specimens are in the Herbarium collected by my predecessor Mr. Prestoe.

No. 7—*Schizea pennula*, Sw.

In our Herbarium are two sheets of this Schizea. Specimens of this fern were also brought in during the month of March. The above ferns grow in open—but partially shaded ground in clayey soil among grasses and other low herbage. They are seldom seen in cultivation.

No. 8—*Fungus on Coccid.*

A fungus which preys upon one of the Coccidæ or scale insects found infesting the leaves of Hippeastrum has been named by the Kew authorities as *Microcera coccophila Desm.* Observation shows that scale insects suffer much from the attack of fungi, in fact these apparently insignificant members of the vegetable kingdom form one of the most serious natural enemies of the scale insects of plants. When it is remembered that in the ultimate stage of its life history, the Coccid or scale becomes a fixture to one particular spot; it is more easy to understand how these insects can be overcome by the mycelium of a fungus.

The latter organism advances towards the insect once it becomes fixed, and grows over it enveloping it as completely as a spider does a fly—and ultimately secures the complete destruction of its life, and the life of the embryos it may contain. In all cases of insect attack it therefore becomes an imperative necessity that the life history of the organism which attacks, should be thoroughly examined, and its natural enemies ascertained; for what may become by some special environment a most serious enemy in one place, may through the presence of natural enemies be practically harmless in another. In this way it becomes evident that the attempt to introduce natural enemies, is a much more intelligent mode of proceeding, than to endeavour to provide "certain cures" or "panaceas" for the evil in the forms of washes or fumigations, although it is true, these have to be resorted to at times to save plants from a persistent attack, in the absence of the natural enemy of the insect.

It is put on record that the practice of introducing natural enemies to subdue or overcome insect attack, has been very successful in many parts of the world and though the attempt may sometimes fail, it is fairly clear that in the end it is a much safer and economical plan than to trust to chemical fumes or to washes. Even the destructive parasol ant might probably be overcome if we could find out its

true natural enemy, but a thoroughly effective one has yet to be discovered, and in the mean time we must accomplish the destruction of the pest in the most economical way that is possible.

195.—EUCHARIS AMAZONICA.

The "Eucharis Lily."

Among all the flowers grown in the West Indies none is more throughly appreciated than *Eucharis Amazonica*.

It flowers if well treated during many months of the year, but the principal show of bloom generally comes in during January and February, although much depends upon the season, and upon the rainfall for the previous months In tropical cultivations quite as much depends upon the season as in temperate climes, and a plant may flower late or early in consequence. The factor in the Tropics being moisture and drought, instead of heat and cold, as in temperate countries. We can always supply water in dry weather, but it is not always possible to protect a large quantity of plants from an excessive fall of rain and prevent them getting more than they require.

In February of 1896, we had plants in 18 tubs with over 100 peduncles, with five or six flowers on each open at one time, making a very fine exhibition of flowers. The plant is one which is admirably suited to the climate. Given a certain amount of shade, plenty of root-room, plenty of manure, and due attention to the watering, few cultivators will fail to grow them well. It is a plant however that does not succeed well with us in the open ground although even in such a position it exists and flowers at times.

196.—"EL CANTO" BARK.

This is a bark of curious character produced by a tree belonging to the order Rosacæ, *Licania hypoleuca, Benth.* The tree grows to a large size and produces pulpy fruits oval in form, some 3 inches in their largest and 2 inches in their shortest diameter.

A paper in our Herbarium published at p. 236 of Bulletin for April, 1894, relates that Dr. Cruger, late Government Botanist in charge of these gardens published a note on the same in 1856 in "Botaniche Zietung"—and further adds, "*three more papers being published now.*" These papers are not in our hands for reference and we are quite unaware of their contents but Dr. Cruger is so well known to have been an accurate and careful observer, and I am in

hope through the publication of this note that some correspondent may inform us where copies of the papers may be had as it is desired to secure them for the Library of the Botanical Department.

Dr. Walter H. Ince has made a preliminary examination of the bark for Silica—it being thought from its brittle and extremely hard character, that a large amount of this substance would be found. The analysis is given below :—

BARK CALLED "EL CANTO."—*Licania hypoleuca, Benth.*

Ash	... ...	9·00 } per cent.
Silica	... ...	·54 }
Silica	... ...	·65 on *dry* bark.

W. H. I.

197.—SUGAR CANE CULTIVATION.

A SHORT review of what has been lately done in connection with this industry, will I trust, prove interesting. At the Agricultural Society's meeting of the 11th December, 1894, a resolution was passed in the following terms :—

"That in the opinion of this committee it is desirable to establish at once "a small experimental plot for growing and testing seedling varieties of cane, "and that a Sub-committee of three be appointed to carry out this object.."

The sub-committee met, and it was unanimously decided that a small experimental plot should be started at the Royal Botanic Gardens under the immediate supervision of the Superintendent, and this course was recommended in the report of the committee which was adopted by the Society in March, 1895. The Sub-committee recommended that this course was advisable for the following reasons :—

1st—To test the value of the seedlings in comparison with other varieties of sugar cane.

2nd—To prove their suitability for cultivation in our climate and soil.

3rd—To provide a depôt for the supply of plants for extended cultivation.

4th—To test the value of manure in all stages of the growth of the cane.

It was stated in my annual report for 1894 that several varieties of seedling canes had been received from Demerara, and some from Barbados and the following was written :—

"The culture of these varieties has been conducted with the greatest care and the reasons for the establishment of the cultivation given as above, have been kept most fully in view, especially the first, as it is considered that the object should be, to select the best canes out of the many varieties so as only to propagate those which give promise of the best yield. After this is fairly ascertained, the next object will then be to test their suitability for culture in Trinidad. It is well known that the soil at the gardens is of the very poorest class, but this will, we think, be not a little advantage in the forthcoming

trials, as canes that will grow and produce good results on such a soil, can hardly fail to do so when planted in better lands. Thirdly we shall endeavour to supply all requisitions for plants on equal terms, working up for the purpose of a stock of plants which will be distributed at a stated time to applicants, so that all may start their culture at the same time, and no advantage will be afforded to one more than another. It is expected that it may be possible to give the results of the first year's trial in an appendix to this report, but in case this work cannot be carried out in time, I may now state that I have received information from Messrs. Jenman and Harrison that the previous results have been fully confirmed by the crop which has been reaped in the British Guiana experiment grounds during 1895. These results show that there are several canes among the seedlings which give a return so far surpassing the Bourbon and other older varieties as to induce the hope that by their extended culture, the sugar industry will receive a substantial benefit, one, sufficient of itself to disperse the gloomy views which have lately been held as to its future. It would appear that the trials of the different manures need not be carried out with haste, as the work of the Demerara experimentalists shows in a most complete and forcible manner, the direction in which success lies, and that all that need be done, at least at present is, to prove by experiment that the same manure can be used in the Trinidad as on the Demerara soils; but even this trial on the experimental grounds will, I fear, not be sufficient for all wants, in so much as the character of the soil in Trinidad estates varies in a large degree, and what would be suitable on one, would not be applicable to others.

Extended trials should therefore be made by the planters themselves, on the various soils, but if they submit to be guided by the results obtained in Demerara, it will, I feel assured, conduce to greater success in the matter of cultural proceedings.

The destructive character of the cane fungus *Trichosphæria saccharı*, has been accentuated by the fact that it has, during 1895, been found present on estates in British Guiana, where a considerable loss is attributed to its action. As mentioned in last year's report "further observation is still required to show to the full extent of its spread, and the measure of its destructiveness." I have received reports from some, that burning the fields have lessened the amount of damage, but on the other hand it has been shown that the burnt areas when replanted have again been badly attacked. Our seedling canes were planted on and near to a spot on which canes infected with

disease had been growing, for the purpose of showing their power of withstanding attack. During 1895 the land on which they were grown was carefully cultivated and the canes were "trashed" at frequent intervals.

The disease is however present in a minor degree in all, but to some varieties little harm has been done, and only one or two really rotten canes have been found.

This fact points the way for further improvement, for it is possible that we may be able to select from the varieties under trial some kind, or kinds which will really be disease resisting varieties, and large sugar producers. I mentioned in my last report that the cane plot would be given good cultivation, to test whether it would have any effect on the progress of *Trichosphæria*. It is, I think, quite clear from the appearance of the canes, that the attention given them has not been in vain, and that the fungus has, in consequence been kept check; as there is certainly, not so much in the plot as there was during the previous year. The attack by "termites" or "white ants" however still continues, and many canes are cut off at or slightly above the ground line.

The element of *yield per acre* must be well considered in conducting an experiment of this kind for a cane yielding high saccharine contents, may be a poor cropper, while a cane yielding moderate sugar contents may give a very large weight of cane to the acre, and thus be more profitable to grow than one yielding higher sugar contents. It would appear desirable therefore, first to select the varieties having high sugar contents, and from these secondly to select those of a vigorous constitution and disease resisting power, and thirdly, those which will afford the largest yield. These objects are well brought out by Messrs. Harrison and Jenman of British Guiana in their reports, and it cannot be doubted that it is the proper plan to secure the best results, as it is one which has long been followed by the Agri-Horticultural world in European countries, in dealing with numerous economic plants and especially with the sugar beet, with unvarying success. To fully carry out the idea, it is however necessary to take seeds again and again from the beet seedling and other canes after test, and by that means ultimately secure varieties of the very highest class, 1st as sugar producers, 2nd as disease-resisting varieties, and 3rd as crop producers.

Why sugar producers are placed first is, that by their use, a larger crop of sugar is produced from a less number of tons of cane;

and therefore labour all round, in both culture and manufacture is reduced. Disease-resisting varieties are placed next, for it is certain that if we have a cane giving a high yield of sugar but liable to be attacked by disease, the actual yield to the planter will certainly be less than with a kind producing less sugar, but not suffering from disease. Canes as "crop-producers" have been placed last in view, as it is evident that a heavy yield of canes, inferior as sugar-producers will lay a great burden upon the planter for carriage. A heavy yield by a high sugar producing cane is therefore the *ultima thule* of the planter.

Altogether the outlook for the sugar planter in so far as regards seedling canes, appears to be a very promising one, and especially so, as it can be shown in reports from Louisiana and British Guiana that canes are now in cultivation, which have, for four years in succession, not only given as many tons per acre as the Bourbon, but have given an increased yield of sugar contents over that variety while maintaining a good disease resisting form of growth. There can therefore be little doubt that the sooner the older varieties are replaced by the best of the seedling kinds, the better for the sugar industry; as it must now be conceded that these varieties are, especially in some districts and in some soils, distinctly inferior to the newer kinds. There is also another point which will not be lost sight of in conducting the cane experiments. It has been noticed that some of the newer canes mature much more rapidly than the older varieties, and one special kind is under observation, which has, under seven months, produced canes nearly twice the length of the other varieties planted at the same time, and I have to-day tested the specific gravity of the juice from a cane taken from the "stool" when it gave 1·040 by balance, not a high density by any means, but still, somewhat remarkable for time of growth. There are at least eight or nine canes of the same size and length, at each stool, grown from cuttings (tops) planted 8th June, 1895, and consequently six months and twenty-two days old on 1st January, 1896. Such a cane I take it would be invaluable to the planter as a "supply" cane. The probability is that the density of juice will improve with age so as to render it little less in value than that from standard kinds at crop time in March."

The above is an extract from the annual report of the Department for 1895, to which the report furnished at the Agricultural Society's Meeting of April, 1896, will form a suitable appendix as it gives the results of the March examination.

CANE SEEDLING CULTIVATION.

Report on cultivation of seedling canes at the Royal Botanic Gardens. Read before the Agricultural Society on the 14th April, 1896.

Early in the year an examination was made of the seedling canes grown in the Royal Botanic Gardens, but as the results shewed that the canes were far from being ripe, it was considered unadvisable to publish them. Arrangements however were made for a further examination in March, and the following table shows the results obtained during that month, which we trust may be found useful for practical purposes. The examination was based upon the value of the Bourbon cane, as grown side by side with seedlings, so as to ascertain the relative value of the latter without reference to the class of soil in which the plants were grown.

A planter therefore who knows what the Bourbon yields will be able from the table to estimate approximately what the seedlings may be worth on his own land. It will be noticed that the Caledonian Queen and Bourbon gave a similar yield of sucrose and taking the value of the seedlings from the sucrose column alone, it will be seen that eleven of the seedlings gave a superior yield to either of these. The yield of Nos. 74 and 78 is low but there were circumstances which account for this, and they are therefore not strictly comparable with others, and their value should rest upon the Demerara examination and not upon ours.

Several other Demerara canes were also under a similar disadvantage, having suffered from too much shade. A cane of No. 95 was tried in January and was found to maintain its high reputation, it was therefore considered best to use all further material for propagation rather than lose it in the mill for testing purposes.

From our examination the canes which stand first, both as sugar producers and croppers are Nos. 61, 102, and 95, and Nos. 1 and 2, these latter indeed gave the highest yield of all, quite unexpectedly. They were raised in the gardens from seed sent us by Mr. Bovell of Barbados, and previously had not been tested. They are light purple canes and fairly good croppers.

The * "Murray" cane is a good cropper and the fastest growing cane among the set, but is poor in juice.

The * "Robinson" is a poor grower and poor in juice.

The * "Hutson" is a very heavy cropper, a hardy cane, and is likely I believe to become a favourite with some planters from its vigorous character and freedom from disease.

The * "Callender" is fairly rich but does not give enough canes to a stool.

The * "Hart" cane with the last four mentioned are from a set raised at Dodd's Barbados; it is a robust looking cane of the Bourbon type, and a fair sugar producer.

No. 53 is a peculiarly brittle cane as a slight pull will snap the cane at its base, and it is quite difficult from the want of fibre to get the canes to draw through our mill. It would be a splendid cane for sale in local markets, as a cane for eating in the fresh state.

Nos. 132 and 128 are both pretty canes, but their yield is poor.

No. 125 is a cane giving a hard woody megass. The question of quality and quantity of megass is one which must enter into the planter's consideration in determining the cane most profitable for him to grow for it has been found that the megass of some kinds of canes does not give the same heating power as

* *These canes showed marked improvement a month later.*

others, and on those estates where megass is used for fuel instead of wood or coal, this is certainly a matter for serious consideration.

Our column shewing percentage of juice extracted is probably somewhat lower than it should be, as the weighing apparatus at our command was not of the highest class. For the next experiments we hope to have a really good balance at hand.

The propagation of the most valuable kinds is being rapidly proceeded with, and we hope to have plants sufficient for distribution early in the coming year. It is not intended to give these results as final in favour of any one special variety; all that can at present be said, is, that there are at the Royal Botanic Gardens canes which deserve a good trial on estates, and we would emphasise the possibility that they may be of the greatest value to planters.

Committee { John S. Wilson. C. W. Meaden. J. H. Hart.

CANE EXAMINATION, 1896.

Name or Number of Cane.		Per cent. Juice Extracted.	Specific Gravity.	Pounds per Gallon.		Quotient of Purity.	
				Sucrose.	Glucose.		
102	(a) ...	67·8	1·075 (e)	1·696	·113	84·3	1
74	(a) ...	62·5	1·063	1·357	·090	78·7	2
78	(a) ...	67·5	1·057	1·028	·176	68·9	3
Cal. Queen	(d) ...	56·5	1·058	1·389	·086	87·4	4
Bourbon	(d) ...	66·5	1·063	1·331	·044	77·2	5
61	(a) ...	63·4	1·072 (e)	1·701	·103	86·6	6
80	(a) ...	60·9	1·067 (e)	1·571	·181	86·0	7
108	(a) ...	56·5	1·069 (e)	1·529	·042	81·2	8
53	(a) ...	68·7	1·053	1·090	·176	75·5	9
128	(a) ...	64·5	1·045	·897	·193	71·1	10
170	(a) ...	58·7	1·068 (e)	1·555	·103	83·6	11
51	(a) ...	63·4	1·063	1·362	·171	79·0	12
81	(a) ...	67·5	1·053	·927	·222	64·2	13
132	(a) ...	66·8	1·046	·814	·200	64·8	14
145	(a) ...	62·5	1·067 (e)	1·566	·095	85·7	15
103	(a) ...	56·2	1·049	1·007	·181	74·9	16
116	(a) ...	58·1	1·066 (e)	1·519	·085	84·3	17
102B	(b) ...	63·1	1·051	·793	·240	57·1	18
Murray	(b) ...	62·5	1·055	·929	·222	66·7	19
Hart	(b) ...	59·3	1·063	1·294	·176	75·1	20
Robinson	(b) ...	...	1·053	·955	·146	66·2	21
Callender	(b) ...	59·7	1·065 (e)	1·419	·142	80·2	22
Hutson	(b) ...	65·6	1·056	1·156	·142	75·4	23
No. 1	(c) ...	60·6	1·077 (e)	1·832	·106	87·2	24
No. 2	(c) ...	63·1	1·074 (e)	1·780	·106	88·1	25
No. 3	(c) ...	64·3	1·068 (e)	1·545	·175	83·1	26
212	(a) ...	66·2	1·048	·647	·200	49·3	27
109	(a) ...	60·6	1·050	·981	·176	71·8	28
129	(a) ...	63·1	1·050	·829	·187	60·7	29
130	(a) ...	61 2	1·061	1·357	·110	81·4	30
89	(a) ...	68·7	1·056	1·035	·150	67·5	31
125	(a) ...	61·2	1·061	1·153	·130	69·1	32
57	(a) ...	61·8	1·060	1·070	·162	65·5	33
220	(a) ...	63·7	1·061	1·247	·136	74·8	34
135	(a) ...	53·1	1·062	1·393	·105	82·4	35
40	(a) ...	57·1	1·060	1·231	·130	75·3	36
240	(a) ...	63·1	1·055	1·054	·142	68·8	37
269	(a) ...	...	1·059	1·070	·187	66·4	38

A later examination 30 days subsequently of some varieties showed an average increase of 0·5 lbs. per gallon of sucrose.

198.—SWEET CASSAVA.

In an analysis published by E. Francis, Esq., late Government Analyst in Trinidad in 1877, the mean yield of Hydrocyanic Acid in Cassava was given as follows :—

Sweet Cassava.		*Bitter Cassava.*
Mean % HCN ·0168	...	Mean % HCN ·0275
Highest % HCN ·0238	...	Highest % HCN ·0442
Lowest % HCN ·0113	...	Lowest % HCN ·0132

Thinking it possible that the variety of Sweet Cassava commonly grown in Trinidad was probably not the best variety, I imported the Jamaica kind, which proves in appearance very distinct from that of Trinidad and gives on examination by the Government Analyst the following yield of Hydrocyanic Acid, viz.: 0·01017 °/₀—which is lower than the lowest return obtained by Francis out of fifteen samples. As pointed out to me in conversation by the Government Analyst the returns given by a single analysis are not sufficient to show that there is a definite difference in the yield of HCN between the two varieties but it certainly shows that there is grounds for further examination.

I have with myself and family and friends partaken of these roots freely when boiled without the slightest harm, and their appearance is certainly quite distinct from the Trinidad variety of Cassava. Dr. Morton's question, whether Sweet Cassava ever becomes bitter is however not yet satisfactorily answered, but I may mention in connection therewith that my friend Dr. G. C. Henderson of Jamaica who was lately travelling in Columbia, states that Jamaicans who have imported the Bitter Cassava in preference to the Sweet as a starch producer, find in Columbia that the bitter variety becomes sweet.

One thing is certain that the less poison the less danger, and it behoves us to procure for table use that variety which is harmless—rather than risk the use of the more dangerous varieties. Bitter Cassava however of the most poisonous kind which has been sliced thin and then dried in the sun or artificially is capable of being used for food without the slightest danger, as the elements of danger are dispersed in the drying process.

ANALYSIS.

The Supt. of the Royal Botanic Gardens.

The sample of "Sweet Cassava" contains 0·01017 % of Hydrocyanic acid.

WALTER H. INCE,
Acty. Government Analyst.

TRINIDAD.

ROYAL BOTANIC GARDENS.

BULLETIN

OF

Miscellaneous Information.

No. 8. OCTOBER, 1896. Vol. II.

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Edited by the Superintendent Royal Botanic Gardens,
J. H. HART, F.L.S.

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1896.

199.—LORANTHACEÆ.

West Indian "Mistletoe."

UNDER this order are classed several *genera* and many *species* of destructive parasites which infest cultivated and forest trees, in Trinidad and the neighbouring Islands. There is no class however to which they appear to do more harm, than to plants of the *Citrus* or Orange family; for Orange trees, when plants of *Loranthus* affix themselves, are speedily sapped of their vitality and eventually destroyed. These pernicious plants also attack *Terminalia catappa*; *Casuarina*; *Grevillea*; *Cordia* and many other native and introduced trees. The determination of those species which are indigenous to the West Indies is much hindered by the difficulty which is experienced in drying the plants to a fit state for the herbarium. The leaves and flowers and sometimes the branchlets are articulated or jointed, and in the process of drying fall to pieces; and therefore much of the character of the plant is hopelessly lost Grisebach names ten species under the *genus Loranthus*, nine species under *Phoradendron* and three under *Arceuthobium*, but several have been named since his time. The Kew Index gives no less than 615 names under *Loranthus* which of course includes species from all parts of the world.

The plants, as represented in Trinidad, are true parasites, and in contradistinction to the Bromeliads or "wild pines," take their nourishment direct from the trees to which they affix themselves.

The distribution of these plants is effected for the most part by the agency of birds which, feeding on the berries, drop the glutinous seeds in situations whence they are able to affix themselves to the bark of trees. It is evident therefore that to lessen the number of plants which produce seeds, should be the aim of the cultivator, and they should be cut out as soon as seen, from the trees to which they have affixed themselves, or they certainly will continue to become the parent of numerous others, year after year, It is not sufficient with many species, simply to cut off the branch of the parasite which is growing on the host plant, but it is also necessary to cut away the branch of the host itself: as several species have the power of starting growth over and over again from the original point of attachment, that species which attacks the orange being one of the number. The species which with us is most common on Orange and other trees is not accurately determined, but it appears to be near to the Peruvian

Loranthus sarmentosus as it has a similar habit, but it may possibly be eventually identified with the West Indian *Loranthus avicularis, Mart,* of Grisebach's Flora, with which it has also characters in common.

200.—The "GRU GRU" PALM—*Acrocomia lasiospatha, Mart.*

At No. 165 p. 113 I offered some notes on the "Gru Gru" Palm and its fibre—and used for it then ame of *Acrocomia sclerocarpa, Mart.* From enquiries since made at the Herbarium Royal Gardens Kew, it now appears that it should be referred to as *Acrocomia lasiospatha, Mart,* and not to the name previously used. As "*all the West Indian specimens in the Kew Herbarium belong to Acrocomia lasiospatha, Mart.*"

201.—MANICARA SACCIFERA, MART.—*Timite.*

This Palm is a native of the lower or swampy lands of the Colony where it grows freely and produces large quantities of seed. These seeds are often borne to the shores of other West Indian Islands a fact which Grisebach records. Dr. D. Morris also in his article on "A Jamaica drift fruit" writes :—*In the West Indies the ripe fruits of a palm unknown in the greater Antilles are continually brought up by the Gulf stream from the South and washed ashore at Jamaica and other places. They are locally called ("in Jamaica") Sea apples or sea coco-nuts. They are the fruits of the "Bussu Palm" ("Manicaria Saccifera") found in Trinidad and the adjacent Mainland of South America. The white kernel is sometimes fresh enough to be eaten after long immersion in salt water. The fruit was gathered by Sloane as long ago as 1687 and he remarked that it was frequently cast on the North-west islands of Scotland by currents and the sea.*"

In the southern parts of Trinidad, at Irois and at Siparia to the South of the Oropuche Lagoon, and in some other districts the Manicaria grows plentifully but in the larger portions of the North Western and central districts, the collector would search for it in vain, except as he approaches the Eastern sea coast, or arrives at a swampy part of a river's bank. In the Royal Botanic Gardens every endeavour has been made to grow them as specimens for many years, and yet only one solitary and somewhat poor specimen exists, and this in a most shady and moist part of the garden.

The leaves of the " Timite" [its Trinidad local name]—when cut and properly cured are used as thatch by the peasantry and even some planters houses are roofed with this material, which, besides being very lasting, secures a delightfully cool interior.

The spathe presents a peculiar shape, and is composed of fibrous material which is reticulated and so elastic as to stretch from two inches in diameter to over nine inches, and can be worn as a hat or bonnet. It is also used in the woods as a strainer for coffee, &c., for which purpose it is well suited, as it shape is somewhat like a kitchen jelly-bag or pointed *Bonnet-de-nuit*. They are sometimes to be found in the curiosity shops of the West Indies.

202.—THE DATE PALM.

Phœnix Dactylifera, Linn.

This palm is perhaps one of the commonest of introduced palms which at present grows in the West Indies, and in nearly every island large trees thirty feet or more in height are to be found, mostly solitary specimens. In the Trinidad garden the system with my predecessor appeared to have been to plant in groups as is necessary if fruit is to be produced, on account of the plants being bi-sexual (*i.e.*) the male and female flowers borne on separate plants. In consequence, fruit has been produced annually for some years past, the seeds have proved fertile, and young plants have been raised. Some years ago there was a Date palm fruiting abundantly in Kingston, Jamaica, owing to the fact that it happened to grow in the neighbourhood of trees of its kind of the opposite sex. It is to be regretted, however, that although the Date palm fruits regularly and abundantly, all the fruit yet seen has been small and of little value, although the trees have been raised from the best of imported table fruits.

The Director of the Royal Gardens, Kew, in a recent issue of the Kew Bulletin, makes note on Mr. Tillson's report of the growth of Dates in Antigua, with regard to this point, and states that the best Dates are only " grown from suckers," and from the character of our seedling produce it is fairly apparent that no " Dates" of economic value will ever be grown in the West Indies unless plants raised from suckers of the best kinds are introduced. As there are thousands of acres of land in the Antillean Archipelago which would grow the palm well, and possibly in the Bahama Group also, no time should be lost on the endeavour to procure what it is hoped will prove of economic

value to us and to others (viz.) "Suckers" of the best kind of Date palms. It came somewhat as a surprise to me to learn that the Director at Kew was unaware of this tree fruiting in the West Indies; but such a fact [which in the multitude of his occupations, is readily understood] shews the stern necessity for accurate annual official record of Agri-Horticultural work being kept by authorized persons, and published by the country which it chiefly interests for reference at other places beside its own centre. The demand for the Annual Reports and Bulletins issued by this Department affords convincing proof in support of the value of such records; as not only are they being sought by cultivators, but they are also in demand at the largest Botanical centres in Europe and America, as affording suitable references to many enquirers, and they bring us an adequate return in exchanges. If the fruiting of the Date palm had been recorded twenty years ago, as it could have been, we might by this time have been in possession of Date palms giving excellent fruit, as I am sure the Director of the Royal Gardens would have been one of the first to help on, as he always does, anything which promises to become of permanent value, and means would have been found to secure plants of the best kinds.

There is just one point more, which, however, should not for a moment retard the introduction: it this is—will the best kinds grown from suckers produce as good a quality of fruit here as in their native country? Let us try and see; we shall be no worse off if we prove a negative while the possibility is encouraging.

203.—ARECA CATECHU, L.

"Areca Nut" or "Betel Nut."

This pretty palm was first introduced into England very many years ago, it is one of the oldest species in cultivation and has been known to the Chinese people from time immemorial.

The earliest mention of this palm in Chinese botanical works is contained* in a description of Changan, the capital of the Emperor Wu-ti, B.C. 140—86, where it is referred to under the name of *Pin-lang*, a name apparently derived from Pinang, and by which it is known in the Malay Islands, whence the Chinese anciently derived their seeds.

Notwithstanding the high estimation in which it has long been held by Asiatics, by whom it is supposed to sweeten the breath,

* Pharmacographia, Flückiger and Hanbury.

strengthen the gums, and improve digestion, it is only official in the British Pharmacopœia as a vermifuge, and is used more especially for the expulsion of the tapeworm *(Tœnia solium)*. The trunk is tall and straight, rising to a height of 40 or 50 feet, and from 10 to 20 inches in circumference, it is cultivated extensively in the Eastern Tropics for the sake of its seeds. The fruit is about the size of a hen's egg, smooth, ovoid, and pointed at the apex, the husk which is thick and fibrous, encloses a single seed somewhat conical in shape, rounded at the apex and slightly concave at the base.

Areca nuts are sold in India both in the husk and without it, and their widespread consumption gives rise to a large trade, the export of these nuts from Ceylon alone is almost incredible as in* 1871, 66,543 cwts., value £62,593 were shipped; in 1872, 71,715 cwts., and in 1875, 94,567 cwts., of the latter quantity 86,446 cwts. were sent to India.

The tree begins to fruit when about five years old and produces on an average about 300 fruits per annum. The seeds are more or less astringent according to the relative extent of their ruminations in which the astringent principle is said to reside, and those seeds in which the albumen is small and has a bluish tinge and in which the ruminations are large and red, are considered the best.

In the East they are extensively used, either in a young state or softened by boiling, as a masticatory, for which purpose narrow pieces are rolled with lime in a leaf of the Betel Pepper, *Piper Betel*, L., this is then chewed, and is hot and acrid; the teeth and saliva are tinged red by its use, giving the mouth a very ghastly bloody appearance.

It is said that natives of Malaya and other countries become so confirmed in the habit of chewing the Betel Nut that they would rather forego meat and drink than their favourite Betel Nuts.

A dentifrice which obtains some favour in England consists of the charcoal of the Areca nut, but it possesses but little advantage over ordinary charcoal beyond its greater hardness, another preparation from the same source is sold in the form of a paste.

W. LUNT.

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* Pharmacographia, Flückiger and Hanbury.

204.—"YAMS."

(Dioscorea Species.)

Under the name "Yam" are cultivated several species of *Dioscorea* which furnish the major portion of the food supply of the native population, besides being generally used by the middle and upper classes. Our last crop was planted in July, 1895, and harvested in February, 1896, or seven months from planting. A reference to page 47 of the Bulletin will show the number and names of the several varieties under cultivation, and I now propose to place these names in proper sequence. As was expected, many of those recorded are merely synonyms, although in more than one instance the names cover varieties which have probably been obtained, 1st, by the conscious or unconscious selection practised by the cultivator, or 2ndly, by the influence of the climate and seasons of the countries in which they have been grown.

There are doubtless several other species of *Dioscorea* grown in various West Indian islands, but the list here given includes those which are most important as food producers for the people. The "Kew Index" under the head of *Dioscorea* give some 300 names, and this of itself will afford some idea of the number of species.

It is not proposed, however, to enter into a discussion of the various species and their differences, but simply to refer them with a few notes as to their proper affinity to the names given by Botanical authorities.

Dr. Nicholls in Tropical Agriculture refers to four species: *Dioscorea alata, D. sativa, D. aculeata*, and *D. triphylla*. Baron Von Mueller in Tropical Plants enumerates twenty species, but his description of the roots of plants under the names given by Nicholls, shew that these authors had certainly different plants in view.

Grisebach in the Flora of the West Indies enumerates nine species, and among these he placed the Linnean—*D. sativa* under the *D. lutea*, of *Mey!* which shows that the nomenclature of the *Dioscoreas* must be admitted to be anything but clear. This no doubt arises from the fact that the parts of the plants required for determination are very difficult to procure, for plants may be well grown for years without furnishing them, and yet be at the same time sufficiently vigorous to ripen good crops of fine edible tubers. We have ourselves grown in these gardens an experimental patch for several seasons, and as yet we have no certain material for the identification of many varieties.

The Botanical names here given are those to which it is believed the various species should be referred, but are still given with some diffidence, and only as material for better identification.

1. *Dioscorea alata, L.*—Negro yam, Barbados yam, white yam.
2. *D—sativa, L.*—Yellow yam.
3. *D—lutea*, Mey—Afou yam.
4. *D—glabra, Roxb.* / *D—batatas, Decas* } Chinese yam.
5. *D—trifida, L.*—Cush-Cush or Indian yam.
6. *D—bulbifera, L.*—Cut and throw away.
7. *D—triphylla, L.*
8. *D—polygonoides*, H.B.K.
9. *D—Kegeliana*, Grisb.

DIOSCOREA ALATA, L.— WHITE YAM.

Stem 4—Winged, angular; leaves, opposite, cordate oblong, or cordate ovate with a spreading basilar sinus, glabrous, devoid of pelucid lines. Tuber large, white.

Under this species we have the following varieties :—

1. Negro yam of Jamaica.
2. Barbados white yam, Barbados water yam.
3. Horn yam.
4. Snake yam.
5. Devil yam.

Of these, so far as the writer's observation goes, the so-called "Negro yam" of Jamaica (var. No. 1) is by far the best for table use. It is very productive and does not take too much room; the tuber is cylindrical, averaging fifteen inches in length and five or six in diameter.

No. 2. The Barbados white and water yams also belong to this species, although there is a distinct difference in the form of the root, which in this variety is palmate or branched like the fingers. Our roots of this variety grown from Trinidad tubers were this year not more than one quarter the size of those grown from sets obtained from the Botanic Gardens, Guiana, eight holes of which produced 327 lbs. gross weight of yam or over 40 lbs. per plant. This variety has also come to us under the name of "Lisbon yam," and it is mentioned in Sloane's Natural History of Jamaica that it obtained this name through being sent *viâ* Lisbon to Africa as stores for slave ships.

"They send them with earth nuts, for Lisbon from St. Thome to victual their slaves by the way."—*Clusius*.

The 3rd variety, or horn yam, is one which grows into the shape of a curled cow's horn. It has a fine skin, is dry and mealy when well cooked, and is altogether a fine table yam.

No. 4. Is a yam very similar to the former, but instead of curling it produces a long tapering and somewhat warty root, in form somewhat like an Indian club. It is a fair yam for the kitchen.

No. 5. Is a very large, coarse and warty yam, and is one which once planted is hard to exterminate. It is useless for table and can only be used for feeding pigs or cattle. In its growth above ground, however, it resembles the better varieties so much as to be almost indistinguishable, except by those who are well acquainted with it.

I have placed the white yam first because it is generally more esteemed for table use. But personally I much prefer the yellow yam which I call for the present ?

DIOSCOREA SATIVA, L. ?

The stem of this is cylindrical, glabrous, covered with prickles at unequal distances below, and somewhat smooth above, leaves cordate, roundish—or cordate, deltoid, cuspidate, 5–7 nerved, basilar sinus, widely open, pellucid, dotted.

There are one or two forms of this variety differing principally in the shape of the root which in general is cylindrical but sometimes becomes palmately branched at the base. It has a roughened and bark-like exterior and a solid yellow flesh which is mealy and dry when boiled. If in good condition this yam forms a better substitute for the "Irish" potato (*Solanum tuberosum*) than any other variety.

The word "Irish" is commonly used in the West Indies to distinguish this esculent from the sweet potato.

Some Europeans prefer it as a vegetable to imported potatoes even of the best kinds, but few will admit so much as this although using it regularly owing to inherent conservatism of character. It is, however, one of the best yams that is grown in the West Indies. It takes nearly a month longer to ripen than *Dioscorea alata, L.*, is very hardy, will stand considerable drought, being quite at home on stony hill-sides. I find Grisebach has included *Dioscorea sativa, L.*, under *D. lutea, Mey*, but according to the Kew determination of specimens in the Trinidad Herbarium, Linnæus' name should be retained for the yellow yam, and that of *Dioscorea lutea, Mey*, should be the proper determination of the plant given by Nicholls as *Dioscorea aculeata* or a plant the tuber of which is known as "Afou" yam.

DIOSCOREA LUTEA, MEY. ?

"Afou yam;" stem cylindrical, glaucous green, in young state prickly. Leaves cordate-ovate, pointed, 7–9 nerved, abundantly dotted with pellucid lines, basilar sinus open, lobes roundish, short.

This is the "Afou" yam of Jamaica, a kind which is also known as "half-a-yam" in Barbados and "*yam a tout ans*" in Trinidad.

The interior of the tuber is yellowish white, and unless fully ripe the flavour is somewhat bitter. It is a coarse yam, and although extensively grown for use by the poorer classes, is not much used by the "well to do." The Trinidad name gives a clue to its being somewhat of a favourite. Of all the varieties, it is the one which can be had most frequently in and out of season, and the practice is to uncover and cut away the tuber from one side of the plant at a time, covering the roots up again, and allowing it to go on producing other tubers; a practice also followed with other species but not in so great a measure as with this kind. "Afou" yam can in fact be had almost all the "year round." *

Dioscorea glabra, Roxb., or D. batatas, Decaisne.

Stem slightly angular, prickly, leaves cordate, pointed, 11 nerved or less—slightly hairy on the upper and lower surfaces, 3 to 5 inches in diameter, sinus almost closed, the lobes overlapping at times.

This yam produces large bunches of cylindrical tubers (10–20) from two to four inches in diameter and from four inches to one foot in length with a soft shining skin. When boiled the tubers are mealy and good, but unripe, they are slightly bitter.

Dioscorea trifida, L.

Stem angular, narrow-winged; leaves 3 to 5, lobed beyond the middle, glabrous, or glabrate beneath, dotted with pellucid lines.

"Cush-cush," "Couche-couche" or "Indian Yam." The tuber of various forms of this species are well known as table vegetables, and are in general use during their season. In Jamaica this is known as the "Indian Yam." In British Guiana a variety of this is called "Buck Yam." Specimens of this variety which were imported to these Gardens were much larger than those grown in Trinidad, and some of the tubers show a distinct tendency to the palmate form, while in Jamaica and Trinidad the roots grown are almost universally cylindrical in form, from six to eight inches in length, and two or three or exceptionally four in diameter.

Nicholls places the "Cush-cush" under *Dioscorea triphylla*, but our specimens do not warrant our following his nomenclature. The word "Cush-cush" is evidently an adaption of the French word Couchée ("place where one stops when travelling") from the root forming the basis of meals taken by travellers when stopping for the night. Roasted "Cush-cush" with a little salt butter being a food commonly used.

* Since writing the above I have received specimens said to be "Afou" yam which proved a fine table variety, but I have yet to prove to what species it belongs.

Dioscorea sp.

"Cut and throw away;" this yam comes nearest to that described by Grisebach as *Dioscorea bulbifera, L.* It was received from Kew some two years ago as "Otaheite Potatoe." It is known in the West Indies as Potatoe yam from the fact of its bearing large quantities of bulbils on the stem of the plants. The stem is sub-cylindrical in form and bears alternate cordate leaves. The tuber is globose or spherical in form and is generally covered with a number of large fleshy roots. Its Grenada name—"cut and throw away"—well indicates its value when compared with the produce of *D. sativa* and *D. alata.* The tubers, however, produce a large percentage of starch of fair quality.

Dioscorea triphylla, L., Dioscorea polygonoides, H.B.K., and *Dioscorea Kegeliana, Grisb.,* are species which grow in Trinidad, but so far as our observation goes, are of little economic importance.

The varieties of *Dioscorea alata* or "white yam" produce in some seasons numerous bulbils, or aerial tubers, which are very useful for propagating purposes, but in other seasons few or none are produced.

The local names for the various kinds are many, and well-mixed; and it would be impossible, if indeed it were desirable, for any writer to enumerate them all.

It is mentioned by Dr. Watt, Reporter on Economic Products for the Government of India, that the word "yam" is probably derived from French *igname,* and the Spanish and Portuguese *inhame,* of which it is probably an Anglo-Saxon corruption.

In a description written in 1888 Dr. Watt enumerates twenty-four (24) species cultivated in the East. Several of these can without much doubt be identified with our cultivated West Indian species and varieties, but it is quite possible that species exist there which might be worth while to introduce to the West, and steps are being taken to procure some of these for trial. Dr. Watt records that some of the West Indian kinds have been exported to the East chiefly through the exertion of Mr. R. Mitchell, Emigration Agent for British Guiana at Calcutta, and they appear to have been highly valued.

Cultivation.

Our method of cultivation in the Royal Botanic Gardens is one which is simple in the extreme, and has given excellent results.

From one-twenty-fifth of an acre, 1,259 lbs. gross weight of yams was raised (crop of 1896).

Deducting 25 per cent. for tops and waste we have a realized yield at the rate of 23,600 lbs. of marketable yam per acre, which at 3 cents or 1½ per lb. gives a gross return of £147 10 per acre.

The system of culture followed is to open trenches two feet wide, and from fifteen to eighteen inches deep, with intervals of five feet. These trenches are filled with a mixture of vegetable refuse, leaves, stable manure, and litter. Upon this is turned the previously excavated soil, which is rounded up into ridges twelve or fifteen inches high, which operation performed leaves a trench between the ridges. On this the yams are planted, and as soon as growth has commenced, bamboo poles are placed for the vine to climb upon; one row of uprights to every third row, and the poles from the rows on either side resting on the ridge pole of the centre row. The growth thus forming a pyramid over each three rows.

The bottoms of the trenches are then forked roughly and supplied with manure, vegetable refuse, or garden sweepings of any kind, and from time to time as opportunity offers until they are full. This affords nutriment to the growing plants, and the roots are kept cool and moist. Nothing more is done except to give an occasional weeding to the plots during the first stages of growth.

The vines quickly cover the ground with a dense shade under which no weeds will grow, and nothing further is required but to see that the vines are properly supported so that air can circulate through and under them, to allow the crop to ripen in due course. Our crop is always harvested during the dry season, and the tubers are dug and stored in a dry dark room. For planting, the upper parts of the yams are used, but when yams are well ripened, the tuber can be cut into pieces, every one of which will make a plant. It is advisable in this case, however, to store them under finely sifted damp vegetable mould or coconut fibre until they start growth, for to plant such pieces into wet soil is to run the risk of their rotting before growth commences. If bulbils or ærial tubers are used for planting, they should be placed for the first year close together, to form good plants or heads for the next season. It has been found better to follow these plans than to adopt those of the native cultivator, who cuts away his yams from the plant while yet growing and leaves the tops to develope into "heads" for the next season. Where a long succession of yam is required, however, the creole plan will give it,

but it maintains the plants in position longer, and the yams are never so well ripened as when grown under the system I have described. Following it, we have ground cleared regularly at certain periods, and a proper system of alternating crops is instituted, which would be absolutely impossible under the native system. The native system is, however, well adapted for hill-side or pocket culture, where only small areas can be allotted to individual plants. Dr. Nicholls in Tropical Agriculture has estimated the yield of yams at four or five tons per annum, but our average nett yield for three years in succession has been over ten tons per acre, or a result which we venture to think fully justifies the system of culture adopted, and it is open to enquirers to call at the Gardens and see these results for themselves.

205.—REPORT ON RE-DISCOVERY OF "SACOGLOTTIS AMAZONICA," Mart.

At pages 151–2 of this volume of the Bulletin the origin of one of the ocean-drift fruits of which notice had been taken in the pages of "Nature" was shortly discussed *(Article 183)*. Feeling certain that the plant in question was still to be found in Trinidad, and having seen on a visit to the Cedros district, that the seeds were very numerous on the beach, I determined to send in search of the tree.

Mr. Lunt's report printed herewith shows how fully successful we have been in obtaining the necessary material for authoritative determination. Specimens have been forwarded to Kew and to Dr. Urban of Berlin and from both places the plant has been decided to be the true *Sacoglottis amazonica* of *Martius* found by him on the banks of the Amazon, specimens of which have long been in European herbaria. The question of the origin of this peculiar drift fruit is therefore finally settled after being a mystery for a series of years. I may mention that some of the fresh fruit which Mr. Lunt brought home on the first trip have germinated and a few healthy plants are now in our hands, which it is hoped will become permanently established in some parts of the Royal Botanic Gardens.

Report of Collecting Expedition in the Cedros District, Trinidad.

March 16th, 1896.

The Superintendent
Royal Botanic Gardens.

I left the Gardens early on the morning of March the 10th, in search of the tree described as *Sacoglottis amazonica*, Mart., in the article by Dr. Morris in "Nature" of November 21st, 1895, a copy of which had been handed to me for perusal.

After covering a distance of some sixty miles by steamer, I landed about midday, at a somewhat wild looking spot near to the site of the old Convict Depôt at Irois the point to which I had been directed to proceed.

David Alexander, a native of some experience in forest travelling, was engaged as porter and guide.

After making arrangements for a place in which to sling my hammock for the night, we set out to explore the immediate vicinity, in order to determine in which direction it would be advisable to begin work next morning. We found, near the place at which we disembarked, three small watercourses containing much stagnant water, owing to the fact that no rain had recently fallen. Large quantities of the seeds or "drift fruit" of which I had come in search were found, appearing to be washed in and out by the tide, so I made a careful examination of each in turn, by going up some distance, to ascertain if the fruits were to be found in the water beyond reach of the ebb and flow. The first did not give any encouragement, but in the second and largest one, we found seeds as far as we went, and as the third terminated at a short distance from the shore in a small lagoon, it was decided to devote attention to the largest on the following morning.

We started about 6 a.m. and made our way up river. The seeds were found so plentifully in the water, that I deemed it advisable to follow the main channel without deviation, and while doing so, examined the trees on the banks by shooting down twigs or leaves, and by climbing the more likely.

This work was continued until noon, when a quantity of the seeds was discovered lying on the ground beneath three large trees which grew close together. I sent the guide up one of these, but when he threw down specimens, it was found that they did not at all correspond to the description of *Sacoglottis*. The second one was then examined, but the margins of the leaves were found to be entire; however, I directed him to search still higher on the same tree, when he found fruits which showed it to be a different tree to that of which we were in search. On examining the third tree, its leaves answered the description of *Sacoglottis*, but the two distinctive glands were not sufficiently apparent to render the identification certain.

Continuing our way until we reached the head of the river, the seeds were still plentiful, but not another likely tree was found, and we returned without being definitely certain about the tree producing them. On the following morning we again started early, but in another direction.

Taking the bridle track which leads towards a small place called Chatham, we followed it about three miles, and then turned into the high woods.

Shortly afterwards, we came to a small watercourse in which again were found plenty of the seeds, and near by, a tree resembling that about which I had remained in doubt on the previous day.

On examining young leaves little doubt as to its identity remained, for it had, in addition to other characters, the two distinctive glands at the base of the leaf-*blade*, but, after a lengthy search, we failed to find either fruit or flowers.

Continuing the search several other trees were found, all of which we examined, and from one of these, three dry fruits were gathered, which positively established its identity. Subsequently we found a small number of perfectly fresh fruits under one of the trees, from it we also procured young flower buds, and from another, an immature but sound fruit. All the fresh fruits found on the ground *had been fed upon by animals*, which had eaten away the bulk of the fleshy pericarp, and the seeds were, at the time, being still further cleaned by ants; a fact amply illustrated by the specimens brought back. The idea, that the *pericarp* or *sarcocarp* of the floating seeds, is worn away by the action of water, appears therefore to be quite untenable.

The marks upon the ripe fruits prove that the pericarp is eaten away by frugivorous animals, and insects, such as squirrels, porcupines, ants, etc., etc., and on tasting it myself, found it very pleasant, resembling in flavour a firm-fleshed pear.

Those examples of the fruit which are found on the sea shore in more or less perfect condition are fruits which have become dry on the tree, in which case the pericarp is quite hard, and in this condition three good examples were secured direct from the tree. From the trees discovered we collected as full specimens of the leaves and flower buds as could be obtained, together with green and dry fruits, I also collected a number of fresh seeds, from which I trust plants may be raised.

Irois Forest is situated in what is called the Cedros district of Trinidad, which forms a peninsula, jutting out westward, about forty miles long; the part visited is situated some sixteen miles in a direct line from the most westerly point.

The coast line at this place is devoted to the cultivation of coconuts, and the land in many places is very swampy, the streams all contain more or less of the mangrove, *Rhizophora mangle*.

The vegetation of the highwoods (as the forest is called) to one who sees it for the first time, is marvellous, and baffles adequate description.

The foliage of the innumerable huge trees forms a continuous canopy, so dense overhead as to be almost impervious to the sun's rays, and the whole mass is entwined, tangled, and bound together by immense lianes, or climbing stems, which stretch away in all directions, and eventually force their way through into the light above, in which position alone their flowers are produced. The commonest tree met with on the first day was the "Mora," *Mora excelsa*, which seemed particularly well fitted, on account of its great height and vigour, for the fierce though silent struggle for existence; the ground beneath the "Mora" trees was thickly strewn with its seeds and from them had sprung up quite a miniature forest of seedling plants. Another giant seen in goodly number was the "Silk Cotton tree," *Eriodendron anfractuosum*. Over one of these grew a plant of *Norantea guianensis* bearing huge masses of flowers, which, waving in mid air under a tropical sun, resembled flames of fire. The "Cashew Nut," *Anacardium occidentale*, was seen near the edge of the forest which was fringed with the well-known "Razor Grass," *Scleria*, which has proved a serious impediment to many a collector. The "Mountain Rose" (Rosa del Monte), *Brownea latifolia*, was to be seen on the banks of the streams, and in this situation the "Timite" or "Bussu," *Manicaria saccifera*, a very beautiful palm, was plentiful. It contrasted strangely with the bolder dark green "Cocorite Palm," *Maximiliana caribæa*, a plant which was not so numerous. The "Chataine," *Pachira insignis*, was also noticed. The part of the forest traversed on the second day was not so dense as that examined on the first day. The two districts are divided by a small road running across the peninsula to Chatham, on the opposite side from the point whence we started on our collecting trip, a distance of some five miles. It is curious to note that we did not find a single specimen of *Mora excelsa* in this part, and I was told by natives who knew the district that the tree was never seen except on the Cedros side of this road. The "Anari Palm," *Prestœa pubigera*, was very common, good walking sticks are made from its stems. A single specimen of the "Canon Ball tree," *Couroupita guianensis*, was seen, and a species of *Bactris* with long spines was also plentiful and decidedly troublesome to my guide, who went barefoot all the time. The "Hog Plum," *Spondias graveolens* was very common, and large stretches of *Spathiphyllum cannifolium* formed a delightful picture on the edges of the forest.

The ferns were varied and beautiful, and orchids were plentiful on the upper branches of the huge trees. Amongst those noticed were *Epidendrum*, *Oncidium*, *Gongora*, *Coryanthes*. *Pleurothallis*, *Rodriguezia*, *Stanhopea*.

The *Sacoglottis* was found fairly common on the second day, whilst on the first we met with but one example, though the quantity of fruits seen proved it to be more plentiful. On leaving the forest on the second day, we crossed a piece of land on which the timber had all been felled. One of the trees was a *Sacoglottis*, and bore a quantity of half developed fruits with some leaves; I learnt on enquiry that the land had been cleared during the previous October. It is probable that the trees will be found in the full flowering stage in May or June.

WM. LUNT,
Assistant Superintendent.

March 16th, 1896.

Since furnishing the above report I was again instructed to visit the same district. I started on June 4th and returned on June 6th.

The trees were found without much difficulty; but the first few met with were too far advanced to furnish good herbarium material, but I eventually discovered one which was in an ideal condition, and from it obtained ample material for the purpose which led to the expedition, namely, the proper identification of the source of one of the drift fruits found on the shores of the West Indian islands.

Besides the full sets of ordinary herbarium specimens, it was made a point to secure a goodly quantity of flowers and small fruits, and preserve them in alcohol for dissection purposes.

On the second expedition I had no guide, but took with me a young African boy to climb the trees, so that I had to rely upon the services of a compass to find our way to and fro in the dense forest.

I am especially pleased to have had the opportunity of undertaking what has proved to be a most enjoyable and interesting expedition, outside of the scientific object for which it was initiated.

W. L.

June 10th, 1896.

206.—NATURAL HISTORY NOTES.

No. 33.—Wood Destruction in Trinidad.

In article No. 152 of the Bulletin, in connection with a note on Termitidæ, I mentioned that there was evidence of the attack of fungi on timber or trees previous to its destruction by Termitidæ. Subsequent and regular observations have shown that in no single case out of the many examined, has the "Wood Ant," "White Ant" or "Termit" been found to destroy wood which is free from the attack of fungi.

On the other hand wherever the mycelium of a fungus has penetrated into wood of any kind the "Termit" follows, apparently as a matter of course, and commences to cut and carry away the tissue. Besides the "Termit" there is a species of true ant (perhaps several), that follow the same lines, and cut up timber attacked by fungi.

This fact is not surprising since the discovery of the nature of the gardens of the "Parasol ant;" an insect that actually cultivates or grows for food, the conidia of a fungus.

The true ants which attack timber, march in columns during daylight, and not in covered runs as do the "Termits" and when these columns are seen in or near a building, it may be assumed as certain that some of its timbers are attacked and being carried away.

This insect as a rule maintains its nest in some neighbouring tree, in a position sheltered from rain, and often travels to a considerable distance from the place where they are working at the destruction of timber.

Their work is mostly hidden from sight, as it is generally the hidden interior of uprights or beams that is carried away, as might be expected, for the fungus will not so easily attack the better dried, exterior parts, which it is usual to cover with paint or other preservative. The attack is also seen to follow as a rule any point which is rendered damp by leakage from the roof or other cause.

It is a common custom to build boarded floors high away from the ground to prevent (so says the builders) the attack of "wood ants."

Now it is clear that the timbers of a floor, near to the ground and insufficiently ventilated must be an ideal situation for the development of fungi known to be wood destroyers; and it is equally certain that nothing can prevent the spread of these organisms in such situations but careful ventilation, and the builder to prevent the attack of the ant, must first of all prevent the attack of the fungus by insisting upon conditions which will ensure perfect ventilation and dryness, which are well known to be antagonistic to the growth of fungi.

Fungus may exist in the wood of buildings when it is to all outward appearance sound; and sometimes its presence can only be detected by taking microscopical sections and submitting them to examination under a high power.

It is not to be wondered at therefore that the ordinary carpenter and builder should blame the Termit, instead of blaming his primary and more insidious enemy the fungus; an enemy which loses no time in taking possession of his timbers whenever they are subjected to a set of conditions of the character previously mentioned.

In a tropical country the habits of Termits may be well studied, and if careful notice is taken in the forests of the country it may be easily seen that *they do not attack sound wood*, but only that which has first been permeated by the mycelium of some fungus, which has probably found entrance to its tissues at some point of injury, or has been able to inflict itself upon its host owing to a loss of vitality arising from some special surrounding condition, or from the want of a proper and continued supplied of plant food.

If observers who hold the opinion that "Termites" destroy *sound wood*, will have the subject of attack *specially examined* they will, it is believed, find sufficient evidence to prove, that the supposed sound Timber is in reality permeated by the mycelium of a fungus, and thus rendered liable to the attack of insects.

It has been observed that the characters shown by the mycelium attacking different woods afford considerable variation, and this leads to the inference that there are numerous species of fungi engaged in such work. The determination of these is however a matter for a Specialist; and can only be properly performed when all the stages of each fungus, are fully known.

That it is really a fungus, which attacks the wood our experiments prove conclusively, and that "Termites" FOLLOW the attack of

fungi is also clearly shown; and the only point not proved is, whether "Termites" do at any time, and in any case *attack sound Timber*; for in all the instances coming under observation here, the mycelium of a fungus can be readily traced, in all parts of the tissue of the specimens attacked.

207.—PERSEA GRATISSIMA.—*Gært.*

"Avocado Pear," "Alligator Pear," Midshipman's Butter," "Zabaca," "Ahuacata." *

This tree is a native of the West Indies and of Tropical America from Mexico to Peru and Brazil (Grisebach), it is commonly cultivated throughout the West Indian Islands where the fruit is much esteemed as a salad, and considered as an absolute necessity when in season by many persons.

The fruit is pear shaped and contains a single large seed surrounded by a mass of firm greenish cream coloured pulp, the flavour, though not very pronounced, is somewhat buttery; the pulp dissolves in the mouth and is delightfully cooling and refreshing, in fact, in its cooling effect on the palate resides its great charm. Like many other West Indian fruits, this should be gathered when in the condition known to old residents, and natives as "full," that is, as soon as they have reached their maximum size, and then allowed to ripen in some cool place.

If gathered as soon as "full," they take from a week to a fortnight to ripen, so that with careful packing and selection, there should be no difficulty in sending it to the English market in first class condition.

The fruits vary considerably in size, but ordinarily they weigh from ¾ of a lb. to 1½ lbs. and may even weigh as much as 2 lbs. Among Avocado Pears as among other fruits there are both bad and good kinds, but the quality of a pear is to be judged exactly like that of a potato, when soft and watery, it is of poor quality, and when firm and mealy and with a fine buttery flavour, it is of the highest standard.

There are many varieties, all of which are raised from seed, distinguishable either by their shape or the colour of their skin when ripe; those resembling in contour the ordinary club-shaped soda water bottle, and those the skin of which turns black or purple when ripe are generally found to be the best.

* Mexican name pronounced ah-wah-kah-tah.—(J.H.H.)

Although in reality a true fruit, it should be classed as a table salad, as it is eaten with the addition of pepper, salt, vinegar, oil, &c., as other salads, which additions are thought to intensify its delicate flavour, but many prefer it dipped in salt and eaten with bread and butter. On first acquaintance it is usually considered to be very insipid, especially if the novice takes it without the proper condiments, but a liking often amounting to a craving is very readily acquired by most people, although instances are known where a lifes residence has not familiarized its use to others. The tree attains a height of 25 to 30 feet and with due attention to cultivation will, in ordinary seasons, produce crops of 12 to fifteen dozen fruits per year, although in a good season this estimate will be largely exceeded. It thrives best on good ground with plenty of moisture, but is impatient of both excessive wet and drought, it is also partial to slight shade more especially on the sides so that fertile valleys would be exactly suited to its requirements. It will of course grow in exposed situations but does not give such good results. An indelible black marking ink is obtainable from the seeds, and an abundance of oil suitable for illuminating purposes from the pulp. A sample of fluid extract of Alligator Pear has recently been received by the Department from Messrs. Parke, Davis & Co., Manufacturing Chemists of Detroit, Mich., U.S.A. It is obtained from the seeds of *Persea gratissima* and is recommended as a remedy in Intercostal Neuralgia, its medicinal properties were known to the natives of S. Mexico through whom Dr. Frœhling of Baltimore became acquainted with it, and on whose recommendation the drug has been prepared.

W. LUNT.

208.—"FUSTIC."

(Maclura tinctoria, Don.)—Morus tinctoria, Leim.)—(Chlorophora tinctoria, Laudich.)

Under the name "Fustic"—"Bois d'orange" "Palo Naranjo"—a fine yellow dye wood is exported from many of the West Indian Islands. The tree producing it belongs to the Order *Urticacæ* (the nettle family). It is nearly allied to *Morus*, the European mulberry, and to another well-known tree, the Letter Wood or Leopard Wood of Trinidad *Brosimum Aubletii, Poepp and Endl.* Fustic is indigenous to the island and grows rapidly, forming a fair-sized tree in good soil in five or six years. The value of the wood per ton, July, 1896, is from £2 15 to £5 5. As only the heart wood is used for export, the outside or sap-wood has to be chipped off, which is the only preparation it requires. Pieces of four feet in length and six inches in diameter

may be sent, but the tree grows to a much larger size, and the larger the wood the better the price obtained. Jamaica ships yearly a fair amount of this dye-wood, but Trinidad has not as yet so far as I am aware, competed in the market. It is not intended to represent "Fustic" as a paying crop to grow when everything else has failed, for if everything else fails "Fustic" will probably be found in the same category, but attention is called to its presence as an indigenous tree which, when fairly well grown and prepared for market, is worth some five guineas per ton. It is not a tree requiring cultivation or shade. It is a true native, and will grow up in many places from self-sown seed. It is not particular as to soil, and will grow in almost any locality if planted, and does not require protection of any kind. It is considered to be a tree fully deserving of the attention of proprietors who wish to improve and increase the value of their properties. A corner planted in "Fustic" would cost little or nothing for upkeep, and would annually increase in value. It is certainly a tree whose growth, with that of Logwood, should be encouraged by those who possess landed interests in the Island of Trinidad.

P.S.—During the current week and for the first time in ten years, we noticed logs of this wood being cut in St. Ann's for export.

August 15, 1896.

209.—GUINEA GRASS.

Panicum maximum, Jacq.—Panicum jumentorum, Pers.

GUINEA GRASS is said to have been introduced into Jamaica as bird food about 1740.

In that colony taxes were paid in 1879 on 115,576 acres under Guinea grass. "Analysis shows it to be very rich in nutritive qualities, and where this grass can be fully established in the West Indies it is probably the best fodder plant known for permanent cultivation."*

Though so largely grown in Jamaica it does not find the same favour in Trinidad, probably owing in some measure to our having a fuller supply of natural fodder in the form of Para grass (*Panicum muticum, Forsk*) which does not require—in our lands—the same care as Guinea grass.

Guinea grass flourishes best on lands having a fair proportion of lime in their composition, and does not do well on heavy clays. It can stand a large amount of drought, but will not endure a soil constantly saturated with moisture. The land should be prepared for planting by ordinary ploughing, or forking, giving it at the same time

* Kew Bulletin.

as much manure, wood-ashes, or vegetable refuse, as can be afforded. Old stools with tops cut some twelve inches above the ground are dug up and divided into small well-rooted portions and used for planting. Each portion should be carefully planted, not too deep! (say three or four inches) and the earth made quite firm around its base. The field looks better when set in rows from twenty inches to two feet apart, but some cultivators prefer to plant irregularly, using the same distances.

The productiveness of a Guinea grass piece depends greatly upon the regularity of the attention it receives. In Jamaica, in limestone districts, and in the Bocas Island, Trinidad, it is thoroughly acclimatised, sows itself, requires no attention, and is practically ineradicable; but in the neighbourhood of Port-of-Spain, and in many other districts it cannot be left to itself, or it will rapidly die out. In Jamaica and in Tobago considerable areas are covered with Guinea grass which has become fully acclimatised, and these are used for grazing purposes, carrying large herds of cattle and sheep.

They receive little more attention besides an annual hoeing, and cutlassing or brushing out, which is really all that is necessary to keep this grass in order where soil and climate are suitable.

In the Homestead grass fields, however, especially on heavy clay or on soil indifferently suited to its culture, Guinea grass requires regular attention.

It had been the system previous to my taking charge of the grass fields at the Botanic Gardens, to hoe and fork through between the plants with great regularity, in fact there was a standing order to fork over at once the area cut over for the daily supply. This system was given a year's trial, but the supply of grass was not equal to the demand, and other measures had to be adopted. It was finally decided to stop forking process and to "*mulch*"* regularly with any manure or vegetable refuse that was available, completely covering the ground between the plants. This mulching has been found, after eight years' practical trial, to be far superior to forking or hoeing, as it prevents weeds growing, keeps the ground moist, and it supplies, by decay, a regular amount of plant food. It is of course necessary that all large weeds should be removed either by pulling up or cutlassing at regular periods, but small or surface weeds will be killed out by regular mulching and by the luxuriant growth of the grass itself. The condition of our field is such that no one can dispute the value

* Mulch is an English term used when the roots of plants are covered thickly with manure or vegetable refuse.

of the process and the abundant crops it gives. Given a good supply of manure and vegetable refuse, regular cutting and regular manuring, Guinea grass will give the largest return of fodder of the most useful kind of grass known in the island, and grass, too, of a kind as suitable for the dray horse, as for his higher classed brother who draws a carriage.

In wet weather Guinea grass, like all other kinds, contains a large amount of water, and if it is possible, it is better to cut fodder and dry it in the sun as opportunity offers, rather than feed it to the animals in a watery condition. If weather permits it may be turned into excellent hay which is really capital food, although queer-looking to the eyes of an American or Europeau who has been accustomed to hay from meadow grasses only. This class of hay is used in Jamaica for racing animals.

Guinea grass should not be allowed to stand long after it flowers as shortly after that period it becomes hard and "boney" and not so useful for the stables : cut, however, just at the flowering period, it is at its prime.

There is decided prejudice against the use of Guinea Grass for cows in Trinidad, and it is alleged that it shortens the supply of milk. Seeing, however, that many "Pens"* in Jamaica have to depend upon it alone for dairy purposes, it is not clear how such a prejudice has arisen in Trinidad, and it is highly probable that if more generally grown, such ideas would quickly vanish. Guinea grass flourishes best under the shade of the umbrageous *Pithecolobium Saman*, the "*Zaman*" of the mainland, and where new fields are being planted this tree should be put in at distances of 80 to 100 feet apart, as it is evidently the best known for the purpose, and the grass will in dry weather be found to grow better under this tree than anywhere else, and it will grow quite as well near to its trunk as at a distance therefrom.

There is a larger form of Guinea grass which has coarse and saw-like edges to its leaves known as St. Mary's grass in Jamaica, where the natives describe it as having "plenty of bones"—(*i.e.*) hard stalks which are not eaten by cattle or horses. This kind should be avoided by the cultivator, for if he gets it for Guinea grass, cultivation will not spread, and no one can wonder why other grasses are preferred, and true Guinea grass gets a bad name. See therefore that the right kind is planted, give it good surface dressings, and it will amply repay any attention that is paid and no better fodder can be found for stable or cattle pen throughout the West Indian islands.†

* Cattle Farms. † A late analysis shews its decided superiority over other grasses.

210.—TRINIDAD ORCHIDS.

"Gongoras."

Grisebach's Flora of the West Indies records *Gongora atropurpurea, Hook*, as indigenous to Trinidad. Hooker's Exotic Flora relates that a plant was sent in 1825 to the Liverpool Botanic Garden from Trinidad by Baron de Schach. The Kew List (1896) gives it as a native of British Guiana. Dr. H. H. Rusby's late expedition to the delta of the Orinoco found it fairly plentiful there, so that it will probably be found in the greater part of the tropical regions of South America on the Atlantic slope. It is a plant that flowers freely every year at the gardens, growing upon blocks of wood or bark without covering of any kind at the root. Gongoras, like several other orchids, have when in good health two classes of roots. First the main or clinging roots and secondly the upright or vertical. These upright or vertical roots are found in Gongora, Coryanthes, Catasetum and Epidendrum, and always commence growth during the moist season, having the green and growing point exactly vertical. On this point is to be seen in damp weather radiant globules of moisture. In dry weather the green and growing point entirely disappears by gradually tapering away into a needle-shaped point when it becomes covered with the white covering common to the clinging roots and becomes practically non-absorbent.

These roots are similar to those exhibited by mangrove and other swamp plants. If the surroundings to lagoon plants are examined closely it will be found that, proceeding from the roots which are below the surface of the mud or water, there are countless thousands of tips which are exactly perpendicular. That these roots perform some function, important both to orchids and to mangroves, &c., is clearly apparent, as where they are most abundant the plant and the tree is most vigorous and in the most robust health. But what that function is exactly, is not yet clear to us, but the feature is such a notable one that it is fully deserving of further close enquiry.

Beside *Gongora atropurpurea* we have *Gongora maculata, Lindly*, which is given by some as a synonym of *Gongora quinquenervis, Ruiz* and *Paron*. This is a much prettier orchid from a florist's point of view than the first mentioned, and flowers more freely.

Besides these, we have another Gongora which gives a straw-white flower, and is distinguished by lighter coloured pseudo-bulbs but for the present we place this with the last named as a variety. Whether the two latter are deserving of specific distinction is a matter

for specialists to settle, but the variation shown in the form of bulbs, and the colour of the flower leads to the belief that the three are merely forms of the one species indicated by the flower being almost identical in form no matter what colour is assumed or what shape is put on by the pseudo-bulb.

Whether they are eventually proved to be species, or mere varieties, it still remains that there are three forms of Gongora native to Trinidad :—1st, the dark purple; 2nd, the spotted; and 3rd, the straw-coloured; all of which are easy of cultivation at or near to sea-level in positions, sheltered from the wind.

211.—"SUGAR CANE."—(*Extract.*)

DOES THE ARROWING OF SUGAR CANE AFFECT ITS YIELD AND ITS SACCHARINE CONTENTS.

In Java it has been observed that of late years the cane is more disposed to flowering than formerly, and this is not to be wondered at. Formerly, the tops from grinding canes were exclusively used for planting new fields, which tops were always taken from stalks that had not blossomed, while, as a rule, no seed was taken from canes which had arrowed. By this means the individuals which had bloomed were always eliminated as material for propagation, causing a greater proportion of the descendants of non-flowering canes to be cultivated. Arrowing of the cane grew more and more uncommon, and gradually a variety of cane has arisen that has lost its capacity of producing flowers. This has however changed, since the planters have been obliged, owing to the sereh disease, to plant cane for seed only in order to be always to have a supply of sound seed cane. The top is cut from these canes when they have reached the age of six months, and have not yet had an opportunity of flowering. In this case one cannot know whether the cane has a disposition to flower or not, and as the whole is planted the unconscious selection of nonflowering cane, formerly in operation, ceases, and at present seed is planted of cane which is disposed to flower as well as of cane which does not show this property.

Bearing this in mind, and also with a view to the questions arising from the discussion as to whether cane from seed can be used as a progenitor of new varieties, which will be more apt to flower than such as have for centuries been propagated by cuttings, it seemed to me not uninteresting to investigate whether canes that had arrowed might perchance be less profitable, as regards yield or saccharine contents, than those from which no flower had proceeded. For this

purpose I made a like experiment on three estates. From a field, where cane which had flowered stood together on the same plots with cane that had not, canes were cut at the moment of maturity. Of both, several thousands were cut and conveyed separately to the mill. On two estates the tops were cut for seed from the non-arrowed canes, and on the third the tops were crushed together with the canes. At the mill 200 canes of each kind were measured and weighed, and afterwards the whole of the cane, both that which had blossomed and that which had not, was ground separately and the juice analysed. The figures obtained were as follows :—

Name of the Estate.	Balapoelang.		Pagongan.		Bandjardawa.	
	Arrowed.	Not Arrowed.	Arrowed.	Not Arrowed.	Arrowed.	Not Arrowed.
Measure in metres	...	...	...	...	2·56	2·60
Weight in kilos., with top ...	1·65	1·88	1·17	1·24	1·83	1·87
„ „ without top ...	...	1·73	...	1·09	...	1·72
Sugar in the juice	19·3	18·8	19·43	17·93	19·11	19·61
Glucose „ „	0·42	0·44	0·37	0·39	0·57	0·49
Brix „ „	21·3	20·2	22·0	20·4	21·09	22·0
Quotient of purity in the juice.	90·6	92·8	88·3	87·9	90·57	89·14
Available sugar „ „ ...	17·3	17·4	16·86	15·46	17·13	17·22
Fibre in the cane	13·2	13·0	...	...	...	...

The analyses of the juice thus showed no considerable difference except in the case of the Pagongan estate, where the percentage of available sugar in the juice of the non-arrowed cane is $1\frac{1}{2}$ per cent. less than in the other case.

Though the flowering of the cane is a distinct loss to the planters owing to the fact that it decreases the available quantity of planting material, IT HAS NO INFLUENCE AS REGARDS THE YIELD IN SUGAR *if the canes are cut in proper time*, but, after this, the flowering cane dies much earlier than cane which has not arrowed. Where circumstances prevent the planter from cutting his canes at the moment of maturity, a field which has arrowed will contain more dead canes than one which has not, but if the crop can be crushed in due time, the difference will not be perceptible.

H. C. Prinsen Geerligs.

Tegal, Java,
24th December, 1894.

212.—BOTANICAL NOTES.

No. 9.—*Mechanical action and irritability in the flowers of "Catasetum tridentatum," Hook.*

Darwin in his work on the "Fertilization of Orchids," carefully describes the structure of the flowers of *Catasetum tridentatum., Hook.* He states that the labellum stands uppermost, forming a helmet or bucket protecting the column and in a position in which it cannot hold nectar,* while his drawings show the position of the antennæ or horns of the column and their position. He argues also the hypothesis that the antennæ are possessed of a special irritability which leads to the ejection of the pollen. Kerner and Oliver in "Natural History of Plants," follow Darwin, but their illustrations show the flower in a reverse position to that in which Darwin describes it to stand, and it is evident from the text that it has been drawn so intentionally.

Darwin, however, is quite correct in describing the position of the flower, and Kerner is as certainly so as Darwin, for the truth is that sometimes the flower stands one way, sometimes the other, and also at every possible angle. *Catasetum tridentatum, Hook.*, is one of the commonest of Trinidad orchids, flowering every season in the Botanic Gardens, and numerous observations on its process of fertilization have been registered. Kerner as well as Darwin discusses the special irritability of the antennæ, and declares that nothing special has been found "to account for it." Darwin allows that in some instances the pollen is ejected by other means, but lays great stress upon the sensitiveness of the antennæ. "*I find no moderate degree of violence on any part of the flowers, excepting the antennæ, produces any effect.*" It is certain, however, that the ejection of the pollinia can be caused by other means than the irritation of the antennæ by touch, for it can be easily proved that a concussion of the flower, the removal of the anther-cap, and pressure exerted on almost any part of the column, and especially any irritation on the margins of the stigmatic pit, will effect this readily if the flower is at a favourable stage of maturity, and irritation of one side will cause the gland of the pollinia to be thrown to the same side, and *vice versâ*; while if both sides are irritated at the same moment the gland is thrown directly to the front.

* Page 232.

Darwin noted that "*flowers when they first arrived were not sensitive, but after the spikes had stood for a day or two in water they became sensitive. Whether this is owing to fuller maturity or to the absorption of water, I know not.*"

There is reason to think that both maturity and absorption have something to do with the so-called irritability, for if the pollinia are fully ripe the disturbance of the anther-cap is quite sufficient to cause the expulsion of the pollinia (as we have proved by experiment on numerous occasions) without in any way touching the "antennæ" or "horns."

On the other hand, the anther-cap can be wholly removed, and the pollen masses will not be expelled, but this can only be effected when the parts are immature. In Darwin's description of *C. saccatum* he states that the right hand antennæ hangs downwards paralysed and functionless. This he repeats twice later on in the same work; while at p. 225 he states that a touch of the right *hand antennæ causes the pollinia to be instantly ejected.* This statement is hard to unravel, but it clearly does not lend itself in direct evidence of special irritability.

A series of sections of flowers taken at different stages of development, appear to show that the expulsion of the pollen does not depend upon any special irritability, but upon *mechanical action alone.*

The pollen masses, the caudicle and the gland or "viscid disk" are seen to be held in place by tissue which, as it matures, granulates and forms a "*layer of separation*," or "*absciss layer*" which allows the division to occur; but until this tissue has properly matured no rupture can or does take place. The antennæ are seen to be merely a prolongation of the material forming the edges of the stigmatic pit, curled into cylindrical form. A part of this curl grips or holds the margin of the caudicle, at the base of the antennæ, and the antennæ at the period of anthesis become turgid, stiff and non-elastic. In this state they furnish levers which are amply sufficient to cause a disturbance of the grip they hold upon the margin of the caudicle, and to produce a vibration or disruption of the separation layer, on being slightly touched.

The horns or points of the antennæ, do not stand near to, but far back from the point of dehiscence of the anther, and the point of the column or rostellum is the first place upon which an insect would alight when visiting these flowers, if standing in certain positions, but it would first have to travel over the easily displaced

anther cap, before reaching the points of the antennæ, which are situated further back. In cases where the pollen is mature and expelled by the displacement of the anther cap, the insect, standing on the column, would, if a large one, receive the flying pollen masses on the underside of the abdomen. If it is a very large insect that causes the displacement of the pollen, by contact with the horns or antennæ, it would receive the pollen masses still further to the rear; but if a small insect effected the disruption of the pollen masses by irritation of the antennæ it is possible for them to fly clear from the flower, and be lost, as there is plenty of room between the anther bed and the points of the antennæ for an insect to effect disruption without receiving upon its body the "viscid gland." If the gland is fixed upon the underside of the insect's body, it is easy to perceive how fertilization may be effected in *Monachanthus viridis*, as the helmet or covering stands in the same position as in *C. tridentatum*, but if the pollen is deposited on the back of the insect it is necessary that it should turn round while in the flower to bring the pollen in contact with the stigmatic cavity of the plant, and this they often do while visiting these flowers. This actually happens when the flower is visited by a small golden-coloured bee, as is shown by a drawing of Dr. Cruger in the Library of the Royal Botanic Gardens, which I am able to confirm by actual observation. Darwin's trials, like all his work, have been faithfully carried out, but they do not appear to be conclusive, for it is seen that the pollen will not be ejected until the separation layer of cells is mature, and that when this occurs the liberation of the anther cap has the same effect as vibration produced by the touching of the antennæ. In a flower of *C. Bungerothii* which was under observation, the pollen masses being liberated by the removal of the anther cap, the caudicle, by its contraction, drew them directly into the stigmatic cavity; showing that under certain circumstances self-fertilization would be effected. In another flower of the same species, however, the pollinia were ejected by irritation of the antennæ. Darwin likens the position of the points of the antennæ to the position of the hands when in defence. Now in a drawing made sixteen years ago, the position observed was as follows:—Looking at the flower with point of column downwards—the right hand horn or antennæ is always to be seen curved round the base of the labellum at the same level as the attachment of the column, with the apex pointing outwards. The left hand "horn" grows straight to the rear and curves upwards slightly towards the opening, and these positions are constant both in *C. Bungerothii* as well as in *C. triden-*

tatum. The drawing I mention has since been confirmed by numerous observations during a series of years.

Dissections of the immature buds shew that the antennæ are only developed after the pollen gland, and all other tissue is completely formed.

When half mature buds are opened, the antennæ are represented merely by a slight prominence on the surface of the column. Darwin states that he is almost certain " that the disk does not separate by the simple mechanical movement of the antennæ," but I venture to assume that his material was inadequate for him to fully demonstrate this, for he certainly failed to do so.

The hypothesis of mechanical action is moreover clearly supported by his own experiments, not only that on *C. saccatum* where the column, *without tension*, had no sensibility, as it certainly would not have if the action is really mechanical as I suggest.

If the arms of a pair of spectacles having curved holders for the ears are brought together, the left upright and the right horizontally folded downwards, they will almost exactly represent the position of the points of the antennæ in the flower of *C. tridentatum.* The point of securest contact between the column and the pollen masses and their appendages has been seen to be situated on the margin of the column on each side of the caudicle, and it is fairly evident that a turgid antennæ would mechanically afford sufficient vibration to cause a disruption of the separation layer, and thus allow of the expulsion of the pollen masses by contraction of the caudicle. If the antennæ are really possessed of a special irritability or stimulating property, proof is necessary to show how it acts ; but so far none has been forthcoming ; Darwin's strongest point, (viz.) the absence of antennæ in *Monachanthus*, being quite as strong if not stronger in favour of simple mechanical action.

Until the perfume of the flower is developed it receives no visits from the fertilizing insects, and some flowers that were emasculated, developed no perfume, but on the third morning after opening were in a shrivelled condition. On the same date flowers that were not emasculated, developed perfume and were visited by insects. Some flowers which developed perfume also changed their position from that at which they stood at the period of *anthesis.* The attractive matter for the bees which visit them appears to be similar in character to that noted in my annual Report for 1890 as the attraction in Coryanthes flowers, and is situated on the underside of the lip.

The perfume is not developed until the parts of the flower are highly turgid, and the anther cap as well as the antennæ capable of causing expulsion of the pollen, shows that there is no special plan for fertilization, but the various sizes of the insects which visit the flower, and the several means of inducing the discharge of the pollen masses, show that the apparatus is capable of effecting fertilization by means of more than one insect and in more than one manner, and that latent mechanical action is a potent factor made use of by the flower to secure this result. J. H. HART.

213.—CIRCULAR NOTES.

Botanical Department, Trinidad.—Circular Note No. 31.

Young Seedling Sugar Canes.

Planters interested in raising seedling sugar canes or wishing to obtain an acquaintance with their earliest form as raised from seed, can now see growing at the Royal Botanic Gardens, numerous young plants.

The appearance of the young plants is so similar to that of many other species of grasses, that they might easily be mistaken by those unacquainted with the character of their growth. In fact it is highly probable that thousands of young seedling canes have been annually hoed away for weeds when the clearing of cane fields has been in progress.

22nd January, 1896. J. H. HART.

214.—IMPROVEMENT OF THE SUGAR CANE.

There was a time not very long ago when the proposal to raise sugar canes from the seeds would have been treated with ridicule. To-day happily it is not only known that the sugar cane will grow from seed, but that the amount of variation which is shown when plants are produced from seeds, is somewhat remarkable. This is beautifully illustrated on the fields devoted to the raising of seedlings in Demerara and Barbados, and may be seen on a somewhat smaller scale in the Royal Botanic Gardens.

The history of the share taken by the Trinidad Gardens in raising seedlings may be briefly recorded. In the Annual Report of the Department for 1890 it was shewn that the prospects of raising canes from seeds were of a very encouraging nature, and that plants had been raised from seeds collected in Barbados. In the following year seeds from Barbados were again received, but none of them germinated. From that time no canes had been raised from seed in the Trinidad

Gardens until the present year (1896), when we succeeded in obtaining a single plant from seed obtained from Forres Park. We have, however, a set of young plants growing in our nurseries, which were received when about 5 inches high from J. R. Bovell, Esq., of Dodds, Barbados. These show clearly the variable character of canes raised from seed, as no two are alike. Messrs. Jenman and Harrison have shown that it does not always follow that seed from a first-class parent will produce a first-class seedling cane—and *per contra*, that first-class canes have been raised from seed taken from kinds considered by planters as inferior. This pronounced character of variation is a most hopeful one for the raisers, as it is evident that it gives a wider range of choice for the selection of kinds suitable for cultivation. The effort of the raisers of the sugar beet have long been directed to secure a strain of plants that would, while giving a large yield per acre, afford at the same time the maximum amount of sugar, and their efforts have been attended with great success, for it is well known that the yield from roots cultivated of recent years show a tremendous advance over the percentage yielded by the beet twenty years ago. Had the yield of the Cane increased in the same proportion as that of Beet, the sugar industry would not have suffered as it has done of late; and why cannot the yield of the cane be increaed ? Mr. Neville Lubbock is reported to have pointed to the bamboo as an example of the size a sugar cane should be, and though we may not get it to reach this, it is apparent from recent experience that great advances can be made.

It is recorded in a recent work on "Plant Breeding" that a seedsman conceived the idea that a new form of bean pod would commend itself to his customers, and wrote to a noted bean raiser to "*make it for him,*" and it is reported that he obtained from the experienced raiser exactly what he required. This may seem to the uninitiated far-fetched; but nevertheless *it is really what is being done with the plants of the regetable, the flower, and the fruit garden;* and why it should not be done for the cane-field, is hard to say. The ideal has been reached with many plants, why not in the canes ?

A beginning has been made and a fair amount of success has been obtained; inasmuch as we have now canes that have given 25 per cent. above the yield of varieties commonly grown; and if we can once get those varieties into the field on a large scale, we shall be able to prove conclusively the value of work done, and we hope to see this accomplished before the return of many seasons, and before "the steed is wholly starved."

There are not a few people whose idea of raising seedling canes is that cane seeds are sown like peas or beans to produce a crop. It is not so; for this would be not only impracticable, but with canes impossible.

The operations are conducted as follows:—Seed is collected from the cane arrow when it is fully ripe, and about to fall. It is of little use to look for the seeds among the feathery part of the arrow, as it is quite impossible to distinguish them with the naked eye on account of their diminutive size—(they may of course be seen with assistance of a lens or microscope)—so that it has to be taken on trust that the seeds are really there.

Boxes of soil are then prepared by burning or scorching it in an iron pot, to destroy all grass seeds that it may contain, and then when pressed firmly down, the seed is sown thickly upon the surface. A sprinkling of earth will flatten this somewhat, and it should then be pressed and watered. After this a pane of glass should be placed over the box or pot to keep the soil humid, and it should be further secured by standing it on pots or stands surrounded by water to keep away seed-eating insects.

In a few days the seedlings will appear like little grass plants. They have been mistaken by myself and others for grass plants, and *vice versâ*—but this is not a great mistake after all, when we consider that the sugar cane itself is a true grass; so that the error of taking the one for the other is simply that of not being able to recognize different *genera* of grasses in their [at present] little studied juvenile forms. To this common error is to be attributed the old idea that the sugar cane could not be reproduced from seed; and it is fairly apparent that numerous young sugar canes have been annually hoed up as "grass." In Barbados in 1888 Messrs. Harrison and Bovell proved that it was possible to grow canes in large quantities from seed, and the Report issued by these gentlemen show how the circumstance was taken advantage of, by making it the first step towards the improvement of the sugar cane by selection from the seedling growths. In the seedling stage (*i.e.*) when the plant is from one to five inches high the cane plant is very tender and susceptible to injury, but once established it grows freely and rapidly into its mature form. Those now in the Gardens planted out when six inches high on April 4th, are now (June 26th) three feet and a half high—a growth fully equal to, if not better than, plants from tops.

The seedling cane plant has a greater tendency to tiller or

produce shoots from the base than plants grown from cuttings, and its value in sugar contents in the first year is not so high as it is when plants are produced from cuttings of the same plant in succeeding years. It has therefore become the rule to plant seedlings largely, and to grow them for several years before finally deciding what their value really is, as sugar producers and croppers; rooting out annually such as prove to be entirely useless for the purpose in view. An examination of their sugar contents is made at intervals during the ripening period so as to ascertain their relative value when compared with kinds of standard merit grown on the same ground.

Although a large number (say 5,000) seedlings may be grown the first season, these will by selection be reduced to some 10 or 15 varieties before they are introduced to the planters for extensive trial. No. 95, of the Demerara set, has stood the test for five successive seasons, and this is followed by Nos. 102, 78 and 74; all of which can be seen growing in the Royal Botanic Gardens side by side with the Bourbon and other standard varieties. All seedlings of whatever character *are propagated for the field by cuttings*, and when an improved variety is found, we have to commence from a single plant to get a stock in hand for the field; a very lengthy process, it is true, but one which may be expedited if a close watch is kept upon the plants, and good culture is given, for we estimate that from a single stool 5,000 or more plants may be obtained in 24 months.

Two canes raised in the Gardens from Barbados seeds in 1889 (both "purple") gave a larger sugar content than the "Bourbon" grown on the same ground. These have been propagated for further trial, now that their value is known. They are quite ordinary looking canes, and were thought of little value previous to examination, and of so little account were they considered that it was actually debated whether they were worth the labour of making the examination. I am glad to say that it was decided to make it, as it is possible these canes may prove worth cultivating on a more extensive scale.

There is no room on the Botanic Gardens to grow sufficient canes for seed purposes, and I propose asking planters to assist me for next year's sowing, by collecting and forwarding to me ripe seeds from the fields under their care.

It is proposed to distribute cane plants of the new varieties early in the year 1897, and we hope to have a large stock on hand so as to get them into the fields, and again into the factory, at as early a date as possible.

26th June, 1896.

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APPENDIX.

ON THE COCCIDÆ (SCALE INSECTS) OF TRINIDAD.

By T. D. A. Cockerell. *New Mexico (U.S.A.) Agricultural Experiment Station.*

I have just finished studying a very interesting series of Coccidæ collected in Trinidad by Mr. J. H. Hart and Mr. W. Lunt, and at Mr. Hart's suggestion offer a revised list of the species known from that island, with notes on those which are of interest among the specimens lately received. It suggests that the West Indian Coccidæ are becoming pretty well known, that among so many specimens have been found only one new species and one new variety. A striking contrast is offered by the Coccidæ of Japan, which the present writer has lately been studying, among which the percentage of new species is very much greater. Similarly, the Coccidæ of Ceylon, studied of late by Mr. E. E. Green, offer a very large percentage of novelties.

In the following list the collectors are designated by letters: U.=F. W. Urich. H.=J. H. Hart. L.=Wm. Lunt. G.=P. L. Guppy. P.=W. P. Pierce. C.=H. Caracciolo. The species and varieties marked (*) are at present only known from Trinidad.

1. *Icerya montserratensis*, R. & H.—H. U. L.
2. *Icerya rosæ*, R. &. H.—U. H.
3. *Dactylopius nipæ*, Mask.—U.
4. *Dactylopius citri*, Boisd.—U.
*5. *Dactylopius sacchari*, Ckll.—U. H.
6. *Dactylopius virgatus* var. *farinosus*, Ckll.—U. H.
7. *Phenacoccus barberi*, Ckll.—U. H.
8. *Orthezia insignis*, Dougl.—U. H.
9. *Orthezia prælonga*, Dougl.—H.
10. *Asterolecanium oncidii*, Ckll.—H.
11. *Asterolecanium aureum*, Boisd.—L.
*12. *Asterolecanium urichi*, Ckll.—U.
13. *Asterolecanium miliaris*, Boisd.—U. H.
14. *Asterolecanium bambusæ*, Boisd.—U.L.
15. *Pulvinaria brassiæ*, Ckll.—H.
16. *Pulvinaria simulans*, Ckll.—U.
17. *Pulvinaria pyriformis*, Ckll.—U.
*18. *Lecanium nanum*, Ckll.—H.
19. *Lecanium mangiferæ*, Green, H.
20. *Lecanium hesperidum*, L.—H.
21. *Lecanium urichi*, Ckll.—U.
22. *Lecanium depressum*, Targ.—U. H.
23. *Lecanium oleæ*, Bern.—U. H.
24. *Lecanium hemisphæricum*, Targ.—G. U. C. H.
25. *Vinsonia stellifera*, Westw.—U. H. L.
*26. *Inglisia vitrea*, Ckll.—U.
27. *Chionaspis braziliensis*, Sign.—U. H.
28. *Chionaspis minor*, Mask.—U. H.
29. *Chionaspis citri*, Comst.—H. C.
30. *Chionaspis biclavis*, Comst.—H.
31. *Aulacaspis boisduvalii*, Sign.—U. H.
32. *Pinnaspis pandani*, Comst.—U. H. L.
*32A. ,, ,, var. *albus*, Ckll.—U. H.
33. *Mytilaspis citricola*, Pack.—U. P. H.
34. *Ischnaspis filiformis*, Dougl.—U. H. L.
35. *Diaspis amygdali*, Tryon.—U. (syn *lanatus*).
*36. *Aspidiotus hartii*, Ckll.—H.
*36A. ,, ,, var. *luntii*, Ckll.—L.
37. *Aspidiotus dictyospermi*, Morg.—H.
38. *Aspidiotus palmæ*, Morg. & Ckll.—U.
39. *Aspidiotus destructor*, Sign.—U. H.
40. *Aspidiotus articulatus*, Morg.—U. H.
41. *Aspidiotus biformis*, Ckll.—H. G.

1. *Icerya montserratensis.*—Fine specimens on rose (Hart). Plenty, with a few *Ischnaspis filiformis*, on a palm (Lunt).

2. *Icerya rosæ.*—Immature specimens on Bassia with an ant (Hart). A few, young, on Mimusops (Hart). On Amherstia (Hart).

7. *Phenacoccus barberi* on Hibiscus leaves (Hart). Formerly described as a variety of *P. yuccæ*, but I think it is a valid species.

9. *Orthezia prælonga.*—Very abundant on leaves of croton (Hart).

11. *Asterolecanium aureum.*—Mr. Hart sends me what I believe to be the true *A. aureum*. It is quite distinct from *A. oncidii*, which Targioni-Tozzetti recently described under *aureum*.

13. *Asterolecanium miliaris.*—In great quantity on stems of bamboo (Hart).

15. *Pulvinaria brassiæ* on leaf of some orchid, with *Lecanium hesperidum* and *Chionaspis braziliensis.* *P. brassiæ* has hitherto been only known from specimens found in an orchid in a greenhouse in Canada. The present specimens differ from the original types in the marginal spines being all entire, and the anal plates do not show the three large bristles on outer hind margin. The antennæ and feet agree precisely with typical *brassiæ.* The ovisacs are about as wide as in the typical specimens, but only about 3½ mm. long, being doubtless not yet fully formed. The species is very closely allied to *P. simulans*, but seems to be distinct.

18. *Lecanium nanum*, n. sp.—Female scale flat, reddish-brown or yellowish, broad-pyriform, shiny, with more or less of a median longitudinal ridge. Length 1½ mm., breadth slightly over 1 mm. Antennæ seven-jointed, but the joints very obscure, 3 much longest, formula apparently 3 (27) 14 (56). Marginal spines very small, entire, rarely slightly branched at end, pointed. Anal plates short and broad, red-brown. Derm with small scattered round gland-dots. The general color of the females after boiling in soda is brown, the contained embryos being pink. Rostral loop extending beyond insertion of posterior legs. Legs very small, ordinary, tarsus about two-thirds length of tibia. The four digitules about of equal size; digitules of claw have rather the larger knobs, which are somewhat obliquely truncate, but all the digitules are fairly slender and have smallish knobs. Those of claw reach considerably beyond tip of claw, but those of tarsus do not reach any further than those of claw.

In the covered runs of some ant, along both sides of the midrib of underside of leaves of Balata, with a few young *Icerya rosæ.*—Hort. Trin., 25th July, 1895. (Hart).

This little species looks just like immature *L. hesperidum*, except that it is rather more pyriform instead of oval. The females were mature and contained many embryos. *L. minimum*, Newst., is a very similar species, but according to Newstead's brief description, differs from *nanum* in the dermis, the antennæ; and, judging from the figure of *minimum*, in the digitules. I am sorry I have no *minimum* to compare, but it seems reasonably certain that it and *nanum* are distinct. Another similar species is *L. rubellum*, Ckll., but *nanum* has not the large claw-digitules of that insect.

20. *Lecanium hesperidum.*—On leaves of an orchid (Hart). New to Trinidad. It may be known from *Pulvinaria brassiæ*, on the same leaves, even when the latter has not yet formed its ovisac, by the much smaller marginal spines and the seven-jointed antennæ.

22. *Lecanium depressum.*—Plenty on Hibiscus (Hart).

23. *Lecanium oleæ.*—On Eriodendron. (Hart).

24. *Lecanium hemisphæricum.*—On Aristolochia. (Hart).

25. *Vinsonia stellifera.*—On Clusia (Lunt). On Asplenium (Hart). Stanhopea (Hart).

27. *Chionaspis braziliensis.*—On an orchid (Hart). These have the female scales much paler than those from Ceylon.

29. *Chionaspis citri.*—Very abundant on limes (Hart).

30. *Chionaspis biclavis.*—On some thorny plant. (Hart). New to the West Indies.

31. *Aulacaspis boisduvalii.* (syn. *tentaculatus*, Morg). On Latania commersoni. (Hart).

32. *Pinnaspis pandani.*—On Pandanus, Areca catechu (with parasitic fungus), and Pinanga Kuhlii. (Hart). Abundant.

32A. *Pinnaspis pandani* var. *albus.*—On Latania commersoni. (Hart). This may be a distinct species; it is known by its white scale and less-developed median lobes.

33. *Mytilaspis citricola.*—Plenty on orange. (Hart).

34. *Ischnaspis filiformis.*—With *Pinnaspis pandani* on Monstera. (Lunt).

36A. *Aspidiotus hartii* var. nov. *luntii* Scale as in *sacchari* and *hartii*, all three of them have a curious pale pinkish-brown tinge. Females, although mature and containing embryos, showing no groups of ventral glands. Anal orifice transversely broad-ovals, a considerable distance from hind end. Median lobes large, rather close but not touching, rounded, sub-truncate, entire; second lobes considerably smaller, entire. Spine-like plates, a little branched, between the lobes. Beyond second lobe is, first of all, touching it, a short tubercle, which may represent part of the lobe; then two rather pointed tubercles, of which the second is the larger and looks like a rudimentary third lobe; between this latter and the second lobe are three branched plates; then comes a long spine-like plate, then a spine, then a group of four long spine-like plates, then an interval, then a rather short spine-like plate; beyond that the margin is crenate.

On stems of some plant, collected by Mr. Lunt, August, 1895. This may be separated from typical *hartii* and *sacchari* thus :—

A. Median lobes deeply notched	*sacchari.*
B. Median lobes nearly or quite entire. Groups of ventral glands present ...	*Hartii.*
Groups of ventral glands absent	*Luntii.*

37. *Aspidiotus dictyospermi.*—On Areca catechu. (Hart).

40. *Aspidiotus articulatus.*—Plenty on leaves of lime at the Railway Station, with *Mytilaspis citricola.* (Hart).

I have asked Mr. Hart to kindly append such further particulars regarding precise localities, abundance and destructiveness, &c., as may be known to him, in a separate article below.

Les Cruces, New Mexico, U.S.A.,
28th November, 1895.

NOTES ON COCCIDÆ BY J. H. HART.

Professor Cockerell has asked me to add a few particulars as to "locality, abundance and destructiveness of the Coccidæ" in the preceding list.

1. *Icerya montserratensis*, *R. & H.*—Found on Clusia, Rose and Livistona chinensis. It is a very handsome species but it does not appear to do any great harm at present. It is the white insect which may be seen on the twigs of the trees of *Clusia* planted in "Almond Walk," Port-of-Spain.

2. *Icerya rosæ*, *R. & H.*—Found on Amherstia, Bassia, and Mimusops always with a small ant on all Garden plants. It apparently loves concealment as in the first instance, it was covered with earth on the base of the stem of the tree and in the latter two cases it was in the covered runs of a small ant *Azteca-chartifex*, n. sp. Forell.

3. *Datylopius sacchari*, *Ckll.*, n. sp.—A mealy bug commonly affecting the sugar cane, but the damage that it does is not readily apparent to any but the closest observer. It is without doubt highly prejudicial, and it should be exterminated where possible.

7. *Phenococcus Barberi*, *Ckll.*—This is very common on Hibiscus of many varieties growing in the Botanic Gardens.

9. *Orthezia prælonga*, *Douglas.*—A very common species on Crotons (*codieums*) of all kinds, especially in arid ground, but it may be removed by a wash made of tobacco and soap.

11. *Asterolecanium aureum*, Boisd.—This was found on leaves of Hippeastrum cultivated under glass. It is commonly destroyed when nearly mature by a white fungus, which has lately been sent for determination.

13. *Asterolecanium miliaris*, Boisd.—This is very plentiful on bamboo stems near an old rubbish depôt on lands at Belmont near the Gardens.

18. *Lecanium nanum*, n. sp.—Interesting as the inhabitant of the runs of the same ant as *Icerya rosæ* (see No. 2), but apparently does little damage.

25. *Vinsonia stellifera*, Westw., is a fairly common scale and is a great trouble on pot plants.

29. *Chionaspis citri*, Comst., is a great pest, but parasitic fungi, and heavy rains are antagonistic to its spread, and it does not appear to make much progress where the plants have plenty of vitality.

30. *Chionaspis biclavis*, Comst.—This was found on the stem of *Flacourtia Ramoutchi*, the well known "Governor Plum." It having found an apparently congenial home on the large and thorny compound spines which cover the stem of that plant.

32. *Pinnaspis pandani*, Comst., is a great pest on palms which are natives of a cooler climate than ours.

33. *Mytilaspis citricola*, Pack., common on orange fruits in St. Anne's.

34. *Ischnaspis filiformis*, Douglas, is a great trouble to us on *Cycas* and several *Palms* and *Aroids*.

36. *Aspidiotus hartii*, Ckll., was found on the roots of *Discorea* or yam. This scale covers the yam roots very plentifully when they are stored for any length of time; but it does not appear to injure growing plants.

37. *Aspidiotus dictyospermi*, Morg., was found on leaves of *Areca catcchu* growing in pots in some quantity in the Nursery grounds of the Botanic Gardens.

39. *Aspidiotus destructor*, Sign., is common on the leaves of *Bassia latifolia* which it covers, and evidently does great harm to the plant.

40. *Aspidiotus articulatus*, Morg., was found at the Railway Station at Port-of-Spain on the leaves of lime. When this insect together with *Mytilaspis citricola* and *Chionaspis citri* attack the trees at the same time, something must be done to decrease their numbers or the trees will surely succumb.

The scale insects until late years were but little studied, and agriculturists as a general rule only know them as "blight." Study of them has however resulted in providing information to the cultivator showing how they may be destroyed or how their ravages may be restricted, and in some cases their attack entirely overcome. There is however, yet, much to be learnt. They have their natural enemies as well as other classes of living organisms, and it will probably be found that by maintaining the proper balance of natnre with regard to these as far as possible, that their attack on any particular plant may be reduced so as not to be practically any important hindrance to the agriculturist.

It is a well known fact that a low state of vitality tends to induce attack, and that when once such pests obtain headway it is very difficult to reduce their numbers except by the use of destructive agents such as the various washes and sprays that are now in common use. No reliance can however be placed upon these sprays, &c., as real exterminators, and unless the general health and economy of the plant is properly attended to the attack will most surely recur. The cultivator's aim therefore, should be first to destroy the insects, then to clean, and to keep clean the plants, and see that they get all that they require in the way of protection, drainage manure and general cultivation.

J. H. HART.

26th December, 1895.

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